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FACILITIES READINESS QUANTIFICATION MODEL USERS MANUAL.(U)
APR 82 J M DEPONAI, L THOMAS, C KUKIELSKI

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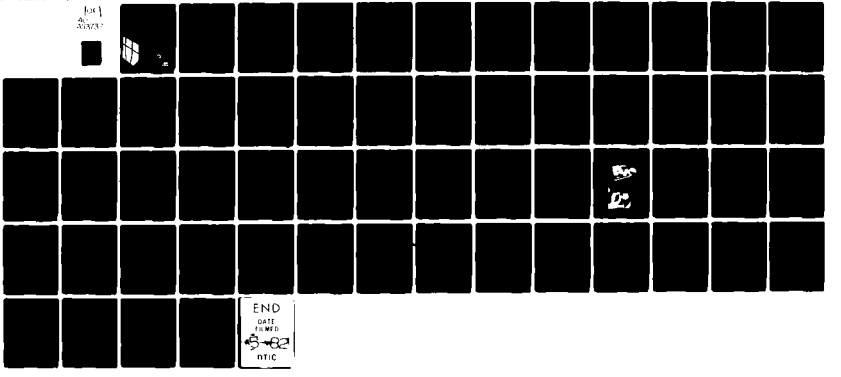

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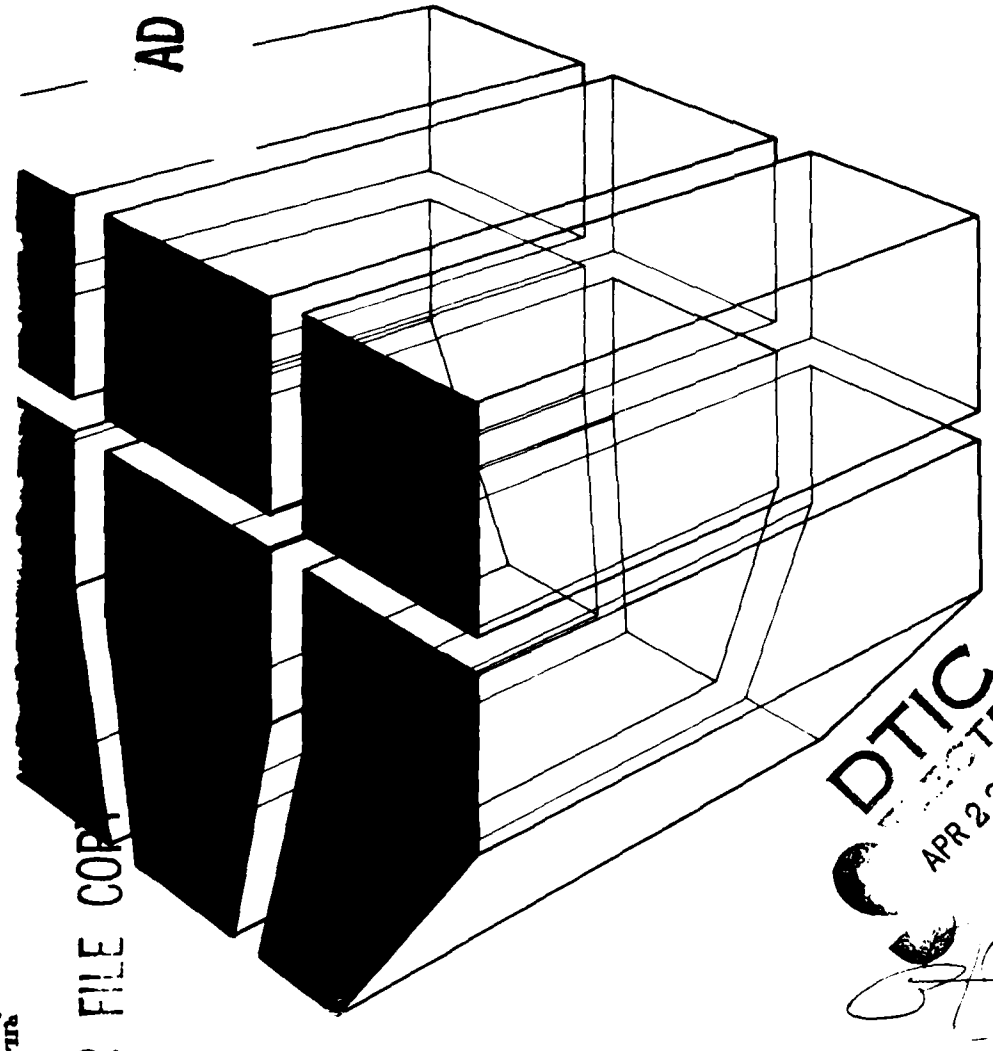
TECHNICAL REPORT P-124
April 1982
Quantification of MCA/Facilities Readiness

FACILITIES READINESS QUANTIFICATION MODEL USERS MANUAL



by
John M. Deponai III
Laure Thomas
Craig Kukielski
Joe Sheffield

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This report describes how to use the Facilities Readiness Quantification Model developed by the U.S. Army Construction Engineering Research Laboratory. This model can be used by Army managers to determine the relative readiness merits of selected projects in the Military Construction, Army (MCA) program. The algorithms required for this model can be prepared manually, or on a programmable calculator.

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FOREWORD

This investigation was conducted for the Directorate of Military Programs, Office of the Chief of Engineers (OCE), under Project 4A762731AT41, "Design, Construction, and Operation and Maintenance Technology for Military Facilities"; Task B, "Construction, Management, and Technology"; Work Unit 031, "Quantification of MCA/Facilities Readiness." The applicable STO is 81-8:7. The OCE Technical Monitors were COL Carpenter, COL Coats, LTC Godfrey, and LTC Edwards, all of DAEN-ZCP-R.

The cooperation and contributions of the Construction Requirements Review Committee are gratefully acknowledged.

The work was performed by the Facility Systems Division (FS) of the U.S. Army Construction Engineering Research Laboratory (CERL). Mr. E. A. Lotz is Chief of CERL-FS.

COL Louis J. Circeo is Commander and Director of CERL, and Dr. L. R. Shaffer is Technical Director.

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FACILITIES READINESS QUANTIFICATION MODEL USERS MANUAL

1 INTRODUCTION

Background

In July 1978, the U.S. Army Construction Engineering Research Laboratory (CERL) was tasked by the Directorate of Military Programs, Office of the Chief of Engineers, to develop a model to relate military construction to force readiness. By November 1980, a pilot model had been developed, tested, and evaluated. In December 1980, it was decided not to develop a computerized system to fully implement the concept. However, OCE directed that CERL develop a noncomputerized version of the model. This version would be used at the option of the Construction Requirements Review Committee (CRRC) to determine the relative readiness merits of a few marginal projects in the Military Construction, Army (MCA) program. CERL used the data obtained during development and testing of the pilot model to devise a noncomputerized model for the CRRC; the algorithms required for this model can be performed manually or on a programmable calculator (see Appendix A).

Purpose

The objective of this study was to develop a model that quantifies the relative impact of all MCA projects on the readiness state of the Army. The objective of this report is to provide user instructions for a model that quantifies the relative impact of *selected* MCA projects on Army readiness.

Approach

1. A comprehensive pilot Facilities Readiness Quantification Model was developed, tested, and evaluated.

2. Data obtained during Step 1 above were used to devise a noncomputerized Facilities Readiness Quantification Model.

a. Algorithms were developed for the noncomputerized model.

b. Programs were created for implementing the model's algorithms on a programmable calculator.

Outline of Report

Chapter 2 of this report gives instructions for CRRC members who will actually rate MCA facility projects using the model. Chapter 3 gives instructions for CRRC support personnel who will process model data. Processing aids, in the form of programs for a Texas Instruments (TI)-59 programmable calcualtor system, are described in Appendices A through D. Blank forms for reproduction are provided in Appendix E.

Mode of Technology Transfer

This report is the technology transfer medium for the results of this study.

2 INSTRUCTIONS TO RATERS

This chapter describes how the CRRC can use a noncomputerized Facilities Readiness Quantification Model to define the relative readiness worth of selected MCA projects. Figure 1 shows the seven-step procedure for implementing the model. To illustrate this procedure, five example MCA projects are compared in this chapter. Some basic information on the example projects is given in Table 1. Example ratings are assigned to *each* project for *each* variable and for *each* rater.* These example ratings will serve as the basis for the data processing examples in Chapter 3.

The following assumptions were made concerning rating authorities:

1. All 10 CRRC voting members would participate in determining mission weights.

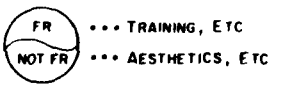
2. The special staff members of the CRRC who represent the Assistant Chief of Engineers (COE), the Comptroller of the Army (COA), The Adjutant General (TAG), and The Surgeon General (TSG) would rate only those projects for which they are the proponent.

3. Other CRRC members would rate all projects.

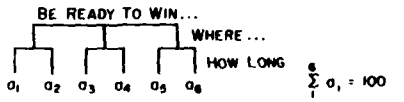
4. At least six or seven raters would participate each time the model was used.

*These ratings are arbitrary and do not represent the actual views of any member of the CRRC.

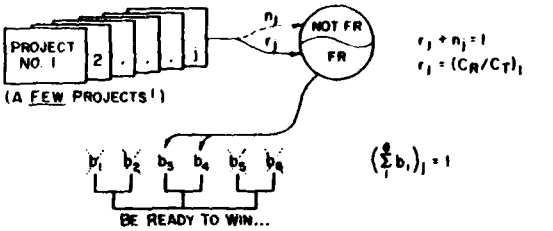
1 USE THE JULY 80 FIELD TEST DEFINITION OF FORCE READINESS (FR):



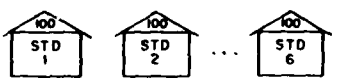
2 WEIGHT EXISTING 6-NODE MISSION HIERARCHY:



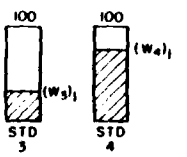
3 DECIDE EACH PROJECT'S RELEVANCE TO FR AND TO FR SUBOBJECTIVES:



4 DEFINE ONE MAX CONTRIBUTION PROJECT FOR EACH OF THE 6 MISSION AREAS:



5 COMPARE PROJECT WORTHS TO APPROPRIATE STANDARDS:



6 COMPUTE THE FINAL B_R/C_T:

$$\left(\sum_{i=1}^{6} a_i b_i w_i\right)_j \times r_j = (B_R/C_T)_j = (B_R/\$PA)_j$$

7 REVIEW AND DISCUSS RESULTS:

RANK	B/C
1	15
2	12
3	8
.	.
.	.
.	.
J	2

Figure 1. General procedure for using the noncomputerized Force Readiness Quantification Concept.

Table 1
Example Projects–Basic Information

Location	Project Number	Project Description	Proponent	MACOM	Program Amount ($K)
Germany	414	Igloo Storage (various)	DCSLOG	USAREUR	1,700
Korea	690	Tactical equip shop (Taegu)	DCSLOG	EUSA	1,000
Fort Benning	342	Tactical equip shops	DCSLOG	TRADOC	4,150
Turkey	203	Administration building (DET 67/168)	DCSPER	USAREUR	1,300
Germany	784	Banking facility (Frankfurt)	TAG	USAREUR	480

Step 1–Define Force Readiness

Table 2 gives a working definition developed by the CRRC of force readiness with respect to MCA facilities. For this report, force readiness is defined as the degree to which a force is capable of accomplishing the requirements of the specific missions or contingency plans for which it is responsible. Since a force is essentially an assemblage of resources, force capability can be viewed as a function of the level of fulfillment of those resources needed to accomplish the missions.

Table 2
Working Definition of Force Readiness

Force Readiness Includes:

- Training
- Maintenance
- Command, Control, Communication (C^3)
- Security
- Manning the Force
- Making Military Operations More Efficient

Force Readiness Does Not Include:

- Asthetics
- Occupational Health and Safety Act (OHSA) Compliance
- Pollution Abatement
- Energy Conservation
- Environment Enhancement
- Convenience of Operations

Step 2–Weight Mission Hierarchy

Using the mission subobjective definitions given in Table 3, each member of the CRRC decides the relative significance of five mission comparisons by entering a ratio on the appropriate line of Form A (Figure 2). This ratio represents the rater's opinion of the relative importance of being ready to win in Europe vs being ready to win in the United States, etc. To assign this ratio, the rater must make a subjective assessment of the relative consequences of losing in one mission area vs another, and of the probability that a conflict would actually occur that would involve the mission areas being considered.

Table 3
Readiness Mission Subobjective Definitions

	Where	Response Phase
Be Ready To Win In . . .	E: Europe (incl Turkey)	EI: Initial (first 30 days)
		ES: Sustaining (after 30 days)
	U: USA (50 States only)	UI: Initial (first day)
		US: Sustaining (after first day)
	O: All Other (anywhere else)	OI: Initial (first 30 days)
		OS: Sustaining (after 30 days)

Raters should assign ratio values independently and should not compare their values directly with those of any other rater. Seven hypothetical ratings for the missions described in Table 2 are shown in Figure 3. Note that ratios in the form of 4/1, 3/1, 5/1, etc. can also be expressed as the whole numbers 4, 3, 5, etc.

The ratios assigned by each rater are processed as described in Chapter 3 to obtain the low quartile, median, and high quartile feedback values for each of the five ratios. The median feedback values then are used to distribute an arbitrary 100 "readiness utiles" across the six mission subobjectives.

A sample of a Form A listing feedback results for the ratios assigned in Figure 3 is shown in Figure 4. After receiving these results, the raters meet to discuss the pros and cons of the issues. Those members who wish to change their ratings enter revised ratings on the feedback sheet. These revised ratings are combined with the original ratings of members who elect not to change their ratings. Then, a new round of feedback results is computed using the most current values

Rater's Initials: _____

Date: _____
(Day/mo/yr)

Rater's Office: (check one)

☐ ACE (1) ☐ DCSLOG (6)

☐ COA (2) ☐ DCSOPS (7)

☐ TAG (3) ☐ DCSPER (8)

☐ TSG (4) ☐ DCSRDA (9)

☐ ACSI (5) ☐ ACSAC (0)

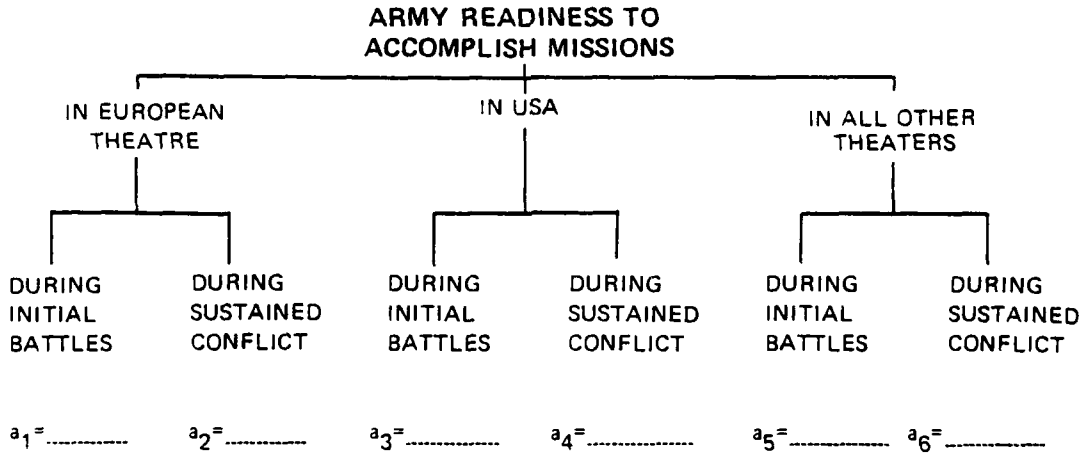
PRIOR RATIOS ASSIGNED

(as of:)

Low Q	Median	High Q
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

RELATIVE IMPORTANCE OF READINESS SUB-OBJECTIVES

Mission Sub-Objectives Being Compared	Relative Significance (Ratio)
European Theater / USA	_____
All Other Theaters / USA	_____
Europe: Initial / Sustained	_____
USA: Initial / Sustained	_____
Other: Initial / Sustained	_____



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Form A (Proposed)

Figure 2. Form A.

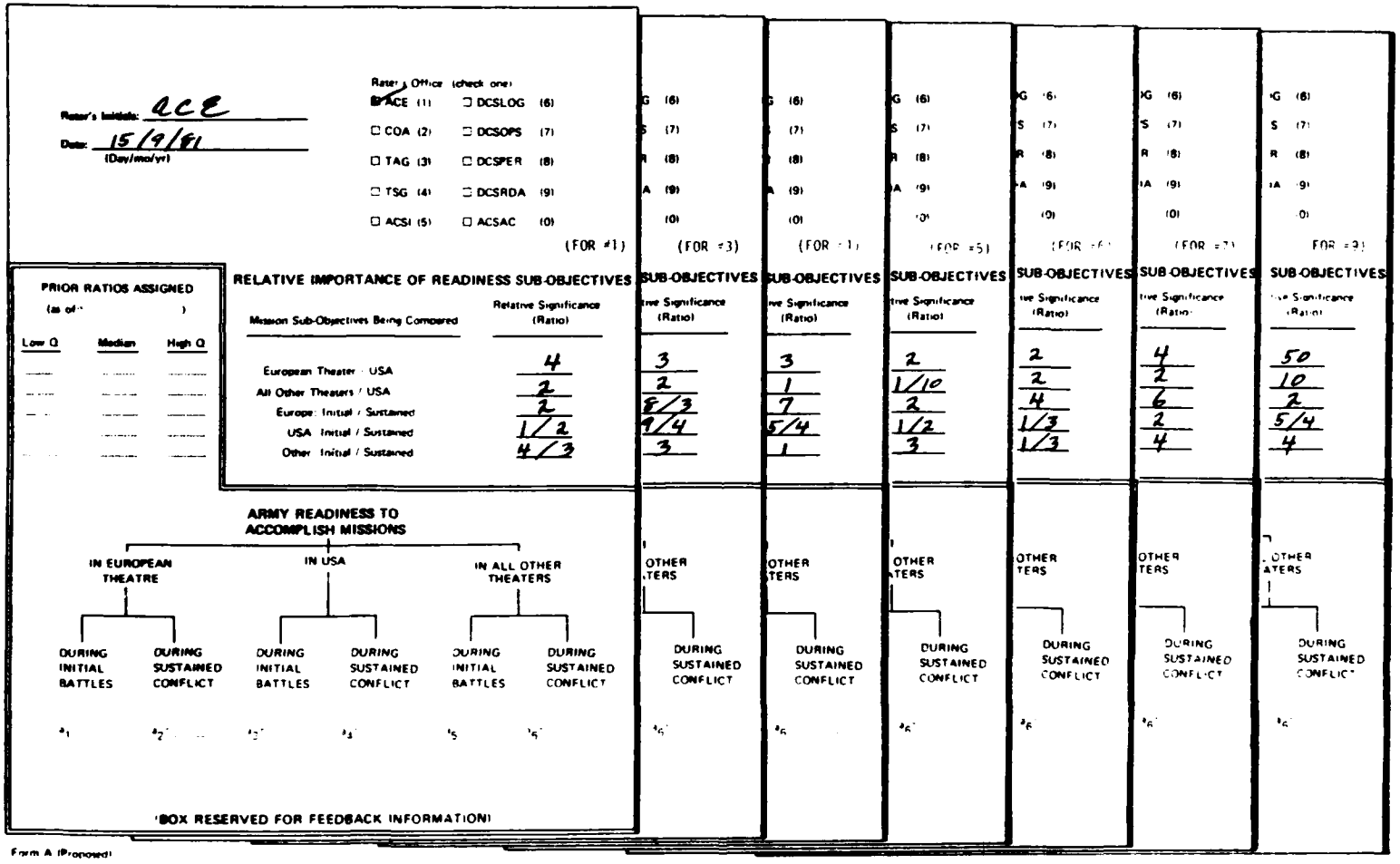


Figure 3. Hypothetical mission weights assigned by CRRC raters.

Rater's Initials: _____

Date: _____
(Day/mo/yr)

Rater's Office: (check one)

☐ ACE (1) ☐ DCSLOG (6)

☐ COA (2) ☐ DCSOPS (7)

☐ TAG (3) ☐ DCSPER (8)

☐ TSG (4) ☐ DCSRDA (9)

☐ ACSI (5) ☐ ACSAC (0)

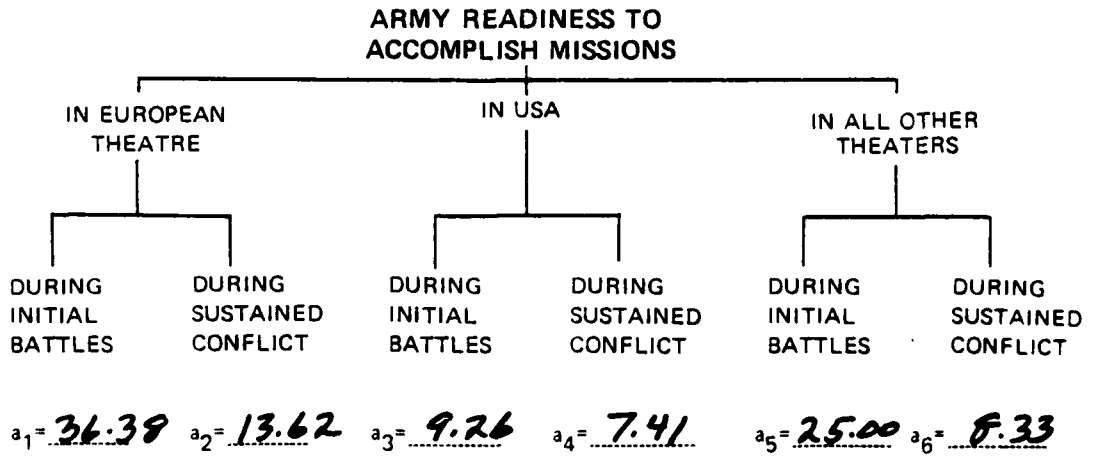
PRIOR RATIOS ASSIGNED

(as of: 22/9/81)

Low Q	Median	High Q
2	3	4
1	2	2
2	2.67	6
0.5	1.25	2
1	3	4

RELATIVE IMPORTANCE OF READINESS SUB-OBJECTIVES

Mission Sub-Objectives Being Compared	Relative Significance (Ratio)
European Theater / USA	_____
All Other Theaters / USA	_____
Europe: Initial / Sustained	_____
USA: Initial / Sustained	_____
Other: Initial / Sustained	_____



(BOX RESERVED FOR FEEDBACK INFORMATION)

Form A (Proposed)

Figure 4. Processed data results for the ratios assigned in Figure 3–sample.

Table 4
Summary of Final B/C Ratios for the Five Sample Projects in Table 1

Location	Project Number	Project Description	SPA ($K)	B_R/SPA
Germany	414	Igloo storage (various)	1,700	27.7
Korea	690	Tactical equipment shop (Taegu)	1,000	19.8
Fort Benning	342	Tactical equipment shops	4,150	15.2
Turkey	203	Administration building (Det 67/168)	1,300	7.6
Germany	784	Banking facility (Frankfurt)	480	0.3

from each of the 10 raters. This can be done at any time and as many times as desired.* However, any change in the median mission weights will change each project's final benefit/cost (B/C) ratio. Thus, every time the median values of the mission weights change, the final B/C ratios for *all* projects must be recomputed. These computations are discussed in Chapter 3.

Steps 3 through 6—Determine Project Values

Each rater uses Form B to record the set of weights assigned to each project (Figure 5). Figure 6 shows how each of six raters might have scored Project Number 414 (from Table 1) as to what percentage (r) of its cost is credited to the procurement of readiness benefits (Step 3 in Figure 1); as to what percentage (b_i) of the total project benefit is attritutable to each readiness subobjective (Step 3 in Figure 1); and as to what the relative worth (w_i) of each benefit is compared to some arbitrary maximum contribution facility (Step 4 in Figure 1) for each readiness subobjective (Step 5 in Figure 1). Again, to ensure the integrity of the data, all raters must assign these values independently, *without* comparing values directly with any other raters.

After all Forms B are completed, they are processed (Step 6 in Figure 1) as described in Chapter 3 to obtain low quartile, median, and high quartile feedback values for each of the variables r, b_i, and w_i. The final project B/C ratio also is computed at this time. All this information is recorded on a blank Form B along with the location, project number, and description of the project to which the feedback applies. Figure 7 shows feedback results for the values assigned in Figure 6.

Hypothetical ratings for Project Numbers 690, 342, 203, and 784 from Table 1 are shown in Figures 8, 10, 12, and 14, respectively. The corresponding feedback data are shown in Figures 9, 11, 13, and 15. Note that if the computations are based on the median value, the effect of unusually high or unusually low scores is eliminated. If *mean* values are used, extreme ratings could have a dramatic effect on the outcome; however, using median values ensures that no one rater can dominate the outcome.

Step 7—Review Results

Table 4 summarizes the final B/C ratios for all five projects listed in Table 1. After final B/C ratios are computed, raters should meet to (1) review these data, (2) identify and resolve any glaring discrepancies, (3) argue the merits and demerits of the various projects in light of the final B/C ratios, and (4) determine whether any rater wishes to change a rating. Assuming at least one member does change a rating - whether mission weight or any project variable - the data would have to be reprocessed. If a median value of any *mission weight* changes, the B/C must be recomputed for *all* projects. However, if only the median *project values* change, only those projects whose median values are affected need to have their B/C ratios recomputed.

3 DATA PROCESSING INSTRUCTIONS

Form A Data

This section describes how to process the data entered by the raters on the right side of the Form A data sheets. Before processing these data, make sure that there is one Form A data sheet for each rater. Although it is not necessary that a full set of 10 be used, at least six are needed to ensure the model will deliver reliable results. The seven Form A rating sheets shown in Figure 3 are used below as an example of how to process Form A data.

1. Convert the ratios to decimal format.

*Obviously, no single rating will remain stable over a long period of time; during periods of high international tension, a rating may change significantly in a short period of time.

Rater's Initials: _____

Date: _____
Day/mo/yr

Rater's Office. (check one)

☐ ACE (1)	☐ DCSLOG (6)
☐ COA (2)	☐ DCSOPS (7)
☐ TAG (3)	☐ DCSPER (8)
☐ TSG (4)	☐ DCSRDA (9)
☐ ACSI (5)	☐ ACSAC (0)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION PN DESCRIPTION

PRIOR RATING RESULTS

(as of)

r VALUES

Low Q	Median	High Q
.....	.....	.....

b VALUES

Low Q	Median	High Q
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

w VALUES

Low Q	Median	High Q
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Note. Feedback values for each r,b, and w are independent of all other r,b,and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Project Relevance to Readiness (%)

r= _____

Mission Sub Objective	Relative Contribution of Project to each Sub-Objective (%)
Europe-Initial	b_1= _____
Europe-Sustained	b_2= _____
USA-Initial	b_3= _____
USA-Sustained	b_4= _____
Other-Initial	b_5= _____
Other-Sustained	b_6= _____

(Total 100%)

Mission Sub- Objective	Project Worth*
Europe-Initial	w_1= _____
Europe-Sustained	w_2= _____
USA-Initial	w_3= _____
USA-Sustained	w_4= _____
Other-Initial	w_5= _____
Other-Sustained	w_6= _____

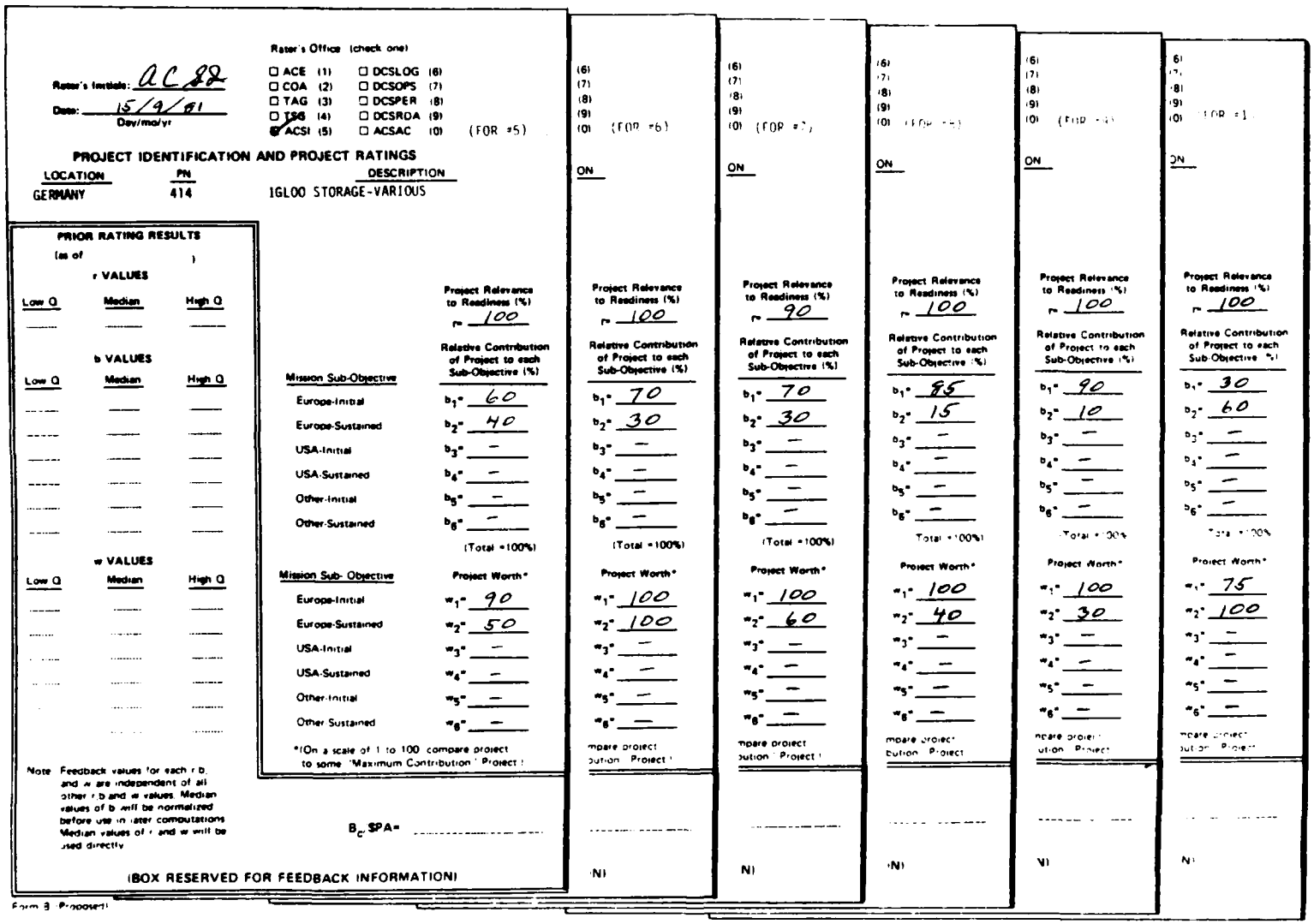
*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)

$B_c/\$PA$= .....

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form B (Proposed)

Figure 5. Form B.



Rater's Initials: AC 82
Date: 15/9/81 (Day/mo/yr)

Rater's Office (check one)

☐ ACE (1)	☐ DCSLOG (6)		
☐ COA (2)	☐ DCSOPS (7)		
☐ TAG (3)	☐ DCSPER (8)		
☐ TSG (4)	☐ DCSRDA (9)		
☒ ACSI (5)	☐ ACSAC (0)	(FOR #5)	(6) (7) (8) (9) (0) (FOR #6)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
GERMANY	414	IGLOO STORAGE-VARIOUS

PRIOR RATING RESULTS (as of)

r VALUES

Low Q	Median	High Q

b VALUES

Low Q	Median	High Q

w VALUES

Low Q	Median	High Q

Note: Feedback values for each r, b, and w are independent of all other r, b and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Mission Sub-Objective	Relative Contribution of Project to each Sub-Objective (%)	Project Relevance to Readiness (%)	Project Worth*
		r = 100	
Europe-Initial	b_1 = 60		w_1 = 90
Europe-Sustained	b_2 = 40		w_2 = 50
USA-Initial	b_3 = —		w_3 = —
USA-Sustained	b_4 = —		w_4 = —
Other-Initial	b_5 = —		w_5 = —
Other-Sustained	b_6 = —		w_6 = —
	(Total =100%)		

*(On a scale of 1 to 100 compare project to some "Maximum Contribution" Project)

B_C $PA= .....

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form 3 (Proposed)

	(6) (7) (8) (9) (0) (FOR #6)
ON	
Project Relevance to Readiness (%)	r = 100
Relative Contribution of Project to each Sub-Objective (%)	b_1 = 70; b_2 = 30; b_3 = —; b_4 = —; b_5 = —; b_6 = — (Total =100%)
Project Worth*	w_1 = 100; w_2 = 100; w_3 = —; w_4 = —; w_5 = —; w_6 = —
mpare project bution Project)	
	(N)

	(6) (7) (8) (9) (0) (FOR #7)
ON	
Project Relevance to Readiness (%)	r = 90
Relative Contribution of Project to each Sub-Objective (%)	b_1 = 70; b_2 = 30; b_3 = —; b_4 = —; b_5 = —; b_6 = — (Total =100%)
Project Worth*	w_1 = 100; w_2 = 60; w_3 = —; w_4 = —; w_5 = —; w_6 = —
mpare project bution Project)	
	(N)

	(6) (7) (8) (9) (0) (FOR #8)
ON	
Project Relevance to Readiness (%)	r = 100
Relative Contribution of Project to each Sub-Objective (%)	b_1 = 85; b_2 = 15; b_3 = —; b_4 = —; b_5 = —; b_6 = — Total =100%)
Project Worth*	w_1 = 100; w_2 = 40; w_3 = —; w_4 = —; w_5 = —; w_6 = —
mpare project bution Project	
	(N)

	(6) (7) (8) (9) (0) (FOR #9)
ON	
Project Relevance to Readiness (%)	r = 100
Relative Contribution of Project to each Sub-Objective (%)	b_1 = 90; b_2 = 10; b_3 = —; b_4 = —; b_5 = —; b_6 = — (Total =100%)
Project Worth*	w_1 = 100; w_2 = 30; w_3 = —; w_4 = —; w_5 = —; w_6 = —
mpare project bution Project	
	(N)

	(6) (7) (8) (9) (0) (FOR #1)
ON	
Project Relevance to Readiness (%)	r = 100
Relative Contribution of Project to each Sub-Objective (%)	b_1 = 30; b_2 = 60; b_3 = —; b_4 = —; b_5 = —; b_6 = — Total =100%)
Project Worth*	w_1 = 75; w_2 = 100; w_3 = —; w_4 = —; w_5 = —; w_6 = —
mpare project bution Project	
	(N)

Figure 6. Hypothetical values assigned to Project Number 414 from Table 1.

Rater's Initials: _____

Date: _____ Day/mo/yr

Rater's Office (check one)

☐ ACE (1)	☐ DCSLOG (6)
☐ COA (2)	☐ DCSOPS (7)
☐ TAG (3)	☐ DCSPER (8)
☐ TSG (4)	☐ DCSRDA (9)
☐ ACSI (5)	☐ ACSAC (0)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
GERMANY	414	IGLOO STORAGE-VARIOUS

PRIOR RATING RESULTS

(as of 22/9/81)

r VALUES

Low Q	Median	High Q
97.5	100	100

b VALUES

Low Q	Median	High Q
52.5	70	86.25
13.75	30	45
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

w VALUES

Low Q	Median	High Q
81.25	100	100
37.25	55	100
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Note: Feedback values for each r,b, and w are independent of all other r,b,and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Project Relevance to Readiness (%)

r = _____

Mission Sub-Objective	Relative Contribution of Project to each Sub-Objective (%)
Europe-Initial	b_1 = _____
Europe-Sustained	b_2 = _____
USA-Initial	b_3 = _____
USA-Sustained	b_4 = _____
Other Initial	b_5 = _____
Other-Sustained	b_6 = _____

(Total =100%)

Mission Sub- Objective	Project Worth*
Europe-Initial	w_1 = _____
Europe-Sustained	w_2 = _____
USA-Initial	w_3 = _____
USA-Sustained	w_4 = _____
Other-Initial	w_5 = _____
Other-Sustained	w_6 = _____

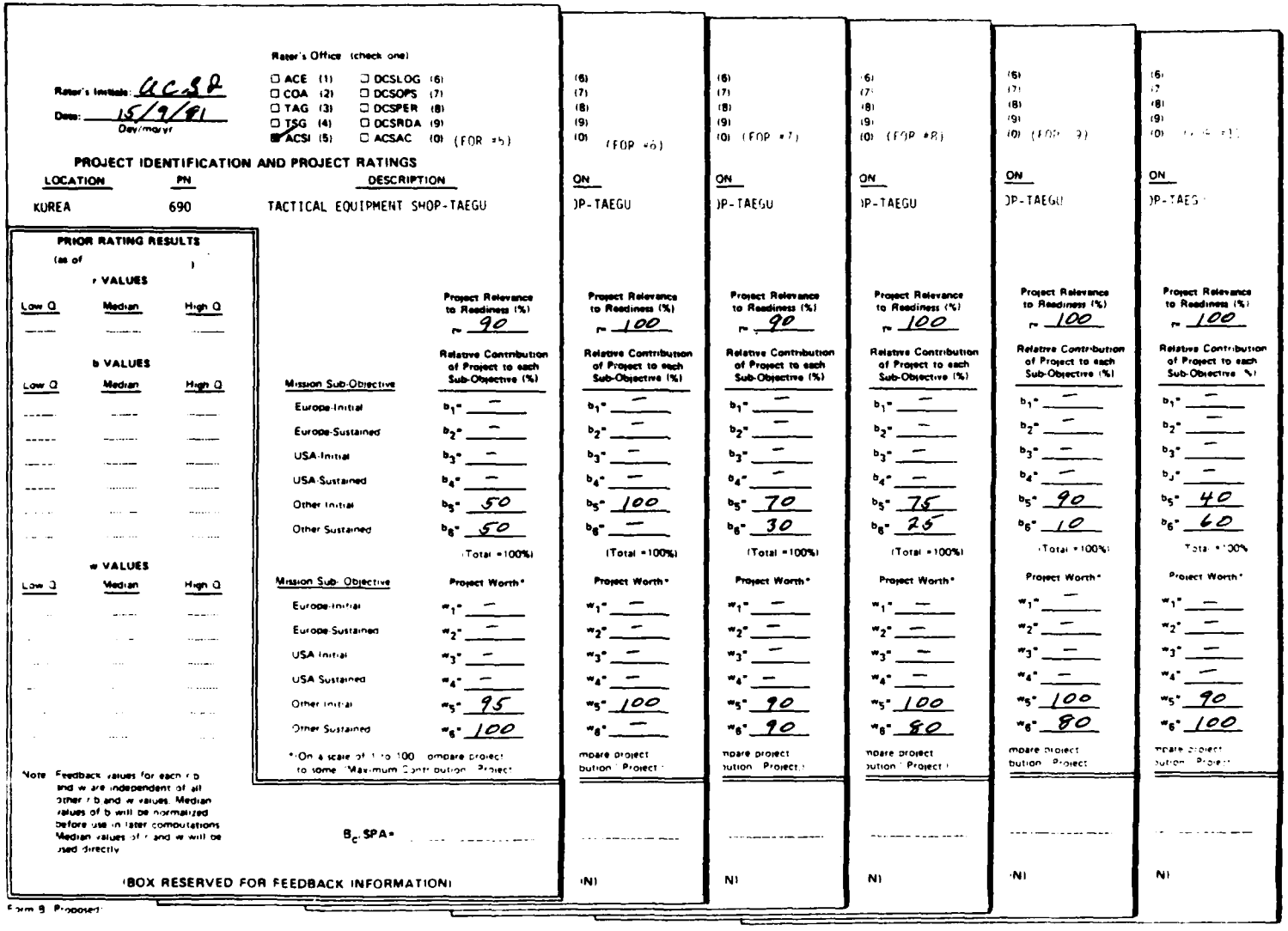
*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)

B_c/$PA= 27.72

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form B (Proposed)

Figure 7. Processed data results for the values assigned in Figure 6.



Rater's Initials: ACSD
Date: 15/9/91 (Day/mo/yr)

Rater's Office (check one)

☐ ACE	(1)	☐ DCSLOG	(6)
☐ COA	(2)	☐ DCSOPS	(7)
☐ TAG	(3)	☐ DCSPER	(8)
☐ TSG	(4)	☐ DCSRDA	(9)
☒ ACSI	(5)	☐ ACSAC	(0)

(FOR #5)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
KUREA	690	TACTICAL EQUIPMENT SHOP-TAEGU

PRIOR RATING RESULTS
(as of)

r VALUES

Low Q	Median	High Q
—	—	—

b VALUES

Low Q	Median	High Q
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

w VALUES

Low Q	Median	High Q
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

Note: Feedback values for each r, b and w are independent of all other r, b and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Mission Sub-Objective	Relative Contribution of Project to each Sub-Objective (%)	Project Worth*
Europe-Initial	b_1 = —	w_1 = —
Europe-Sustained	b_2 = —	w_2 = —
USA-Initial	b_3 = —	w_3 = —
USA-Sustained	b_4 = —	w_4 = —
Other Initial	b_5 = 50	w_5 = 95
Other Sustained	b_6 = 50	w_6 = 100
	(Total =100%)	

*On a scale of 1 to 100, compare project to some "Maximum Contribution" project

Project Relevance to Readiness (%): r = 90

B_c SPA = ——

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form 9 Proposed

(6)	(6)	(6)	(6)	(6)
(7)	(7)	(7)	(7)	(7)
(8)	(8)	(8)	(8)	(8)
(9)	(9)	(9)	(9)	(9)
(0) (FOR #6)	(0) (FOR #7)	(0) (FOR #8)	(0) (FOR #9)	(0)
ON	ON	ON	ON	ON
)P-TAEGU	)P-TAEGU	)P-TAEGU	)P-TAEGU	)P-TAEG
Project Relevance to Readiness (%) r = 100	Project Relevance to Readiness (%) r = 90	Project Relevance to Readiness (%) r = 100	Project Relevance to Readiness (%) r = 100	Project Relevance to Readiness (%) r = 100
Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)
b_1 = —	b_1 = —	b_1 = —	b_1 = —	b_1 = —
b_2 = —	b_2 = —	b_2 = —	b_2 = —	b_2 = —
b_3 = —	b_3 = —	b_3 = —	b_3 = —	b_3 = —
b_4 = —	b_4 = —	b_4 = —	b_4 = —	b_4 = —
b_5 = 100	b_5 = 70	b_5 = 75	b_5 = 90	b_5 = 40
b_6 = —	b_6 = 30	b_6 = 25	b_6 = 10	b_6 = 60
(Total =100%)	(Total =100%)	(Total =100%)	(Total =100%)	(Total =100%)
Project Worth*	Project Worth*	Project Worth*	Project Worth*	Project Worth*
w_1 = —	w_1 = —	w_1 = —	w_1 = —	w_1 = —
w_2 = —	w_2 = —	w_2 = —	w_2 = —	w_2 = —
w_3 = —	w_3 = —	w_3 = —	w_3 = —	w_3 = —
w_4 = —	w_4 = —	w_4 = —	w_4 = —	w_4 = —
w_5 = 100	w_5 = 90	w_5 = 100	w_5 = 100	w_5 = 90
w_6 = —	w_6 = 90	w_6 = 80	w_6 = 80	w_6 = 100
mpare project bution Project	mpare project bution Project	mpare project bution Project	mpare project bution Project	mpare project bution Project
(N)	N)	N)	(N)	N)

Figure 8. Hypothetical ratings for Project Number 690 from Table 1.

Rater's Initials: _____

Date: _____ Day/mo/yr

Rater's Office: (check one)

☐ ACE (1)	☐ DCSLOG (6)
☐ COA (2)	☐ DCSOPS (7)
☐ TAG (3)	☐ DCSPER (8)
☐ TSG (4)	☐ DCSRDA (9)
☐ ACSI (5)	☐ ACSAC (0)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
KUREA	690	TACTICAL EQUIPMENT SHOP-TAEGU

PRIOR RATING RESULTS

(as of 22/9/81)

r VALUES

Low Q	Median	High Q
90	100	100

b VALUES

Low Q	Median	High Q
–	–	–
–	–	–
–	–	–
–	–	–
47.5	72.5	92.5
7.5	27.5	52.5

w VALUES

Low Q	Median	High Q
–	–	–
–	–	–
–	–	–
–	–	–
90	97.5	100
60	85	100

Note: Feedback values for each r,b, and w are independent of all other r,b,and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Project Relevance to Readiness (%)

r= _____

Mission Sub-Objective	Relative Contribution of Project to each Sub-Objective (%)
Europe-Initial	b_1= _____
Europe-Sustained	b_2= _____
USA-Initial	b_3= _____
USA-Sustained	b_4= _____
Other-Initial	b_5= _____
Other-Sustained	b_6= _____

(Total =100%)

Mission Sub- Objective	Project Worth*
Europe-Initial	w_1= _____
Europe-Sustained	w_2= _____
USA-Initial	w_3= _____
USA-Sustained	w_4= _____
Other-Initial	w_5= _____
Other-Sustained	w_6= _____

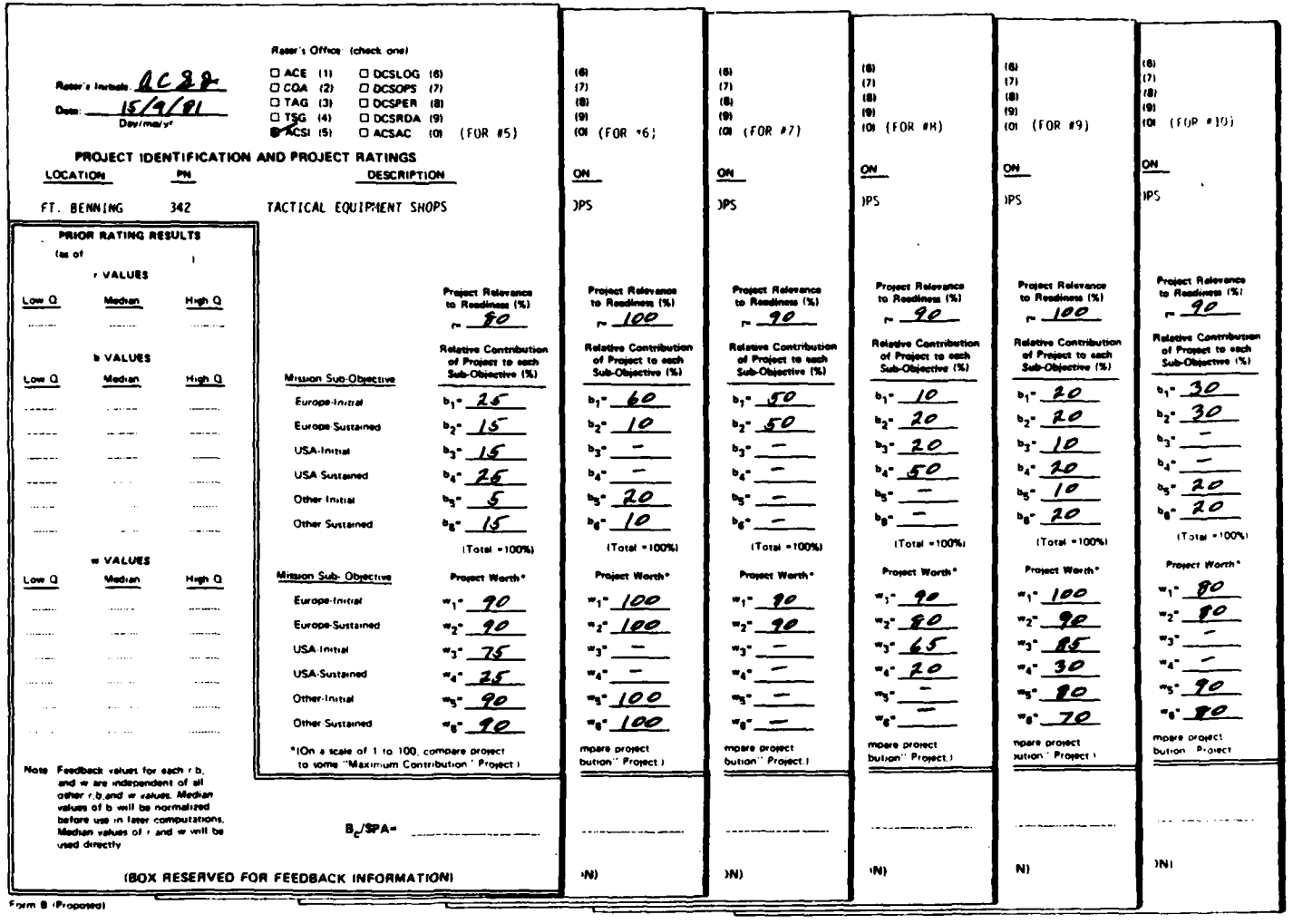
*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)

B_c/SPA= 19.77

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form 3 Proposed

Figure 9. Feedback results for the values in Figure 8.



Rater's Initials: AC 22
Date: 15/9/81 (Day/mo/yr)

Rater's Office (check one)

☐ ACE	(1)	☐ DCSLOG	(6)
☐ COA	(2)	☐ DCSOPS	(7)
☐ TAG	(3)	☐ DCSPER	(8)
☐ TSG	(4)	☐ DCSRDA	(9)
☐ ACSI	(5)	☐ ACSAC	(0) (FOR #5)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
FT. BENNING	342	TACTICAL EQUIPMENT SHOPS

PRIOR RATING RESULTS
(as of)

r VALUES

Low Q	Median	High Q

b VALUES

Low Q	Median	High Q

w VALUES

Low Q	Median	High Q

Note: Feedback values for each r, b, and w are independent of all other r, b, and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form 8 (Proposed)

(6)	(6)	(6)	(6)	(6)	(6)	(6)
(7)	(7)	(7)	(7)	(7)	(7)	(7)
(8)	(8)	(8)	(8)	(8)	(8)	(8)
(9)	(9)	(9)	(9)	(9)	(9)	(9)
(0) (FOR #6)	(0) (FOR #7)	(0) (FOR #8)	(0) (FOR #9)	(0) (FOR #10)		
ON	ON	ON	ON	ON		
)PS	)PS	)PS	)PS	)PS		
Project Relevance to Readiness (%) r = 80	Project Relevance to Readiness (%) r = 100	Project Relevance to Readiness (%) r = 90	Project Relevance to Readiness (%) r = 90	Project Relevance to Readiness (%) r = 100	Project Relevance to Readiness (%) r = 90	
Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)	Relative Contribution of Project to each Sub-Objective (%)	
Mission Sub-Objective						
Europe-Initial b_1 = 25	b_1 = 60	b_1 = 50	b_1 = 10	b_1 = 20	b_1 = 30	
Europe-Sustained b_2 = 15	b_2 = 10	b_2 = 50	b_2 = 20	b_2 = 20	b_2 = 30	
USA-Initial b_3 = 15	b_3 = —	b_3 = —	b_3 = 20	b_3 = 10	b_3 = —	
USA-Sustained b_4 = 25	b_4 = —	b_4 = —	b_4 = 50	b_4 = 20	b_4 = —	
Other-Initial b_5 = 5	b_5 = 20	b_5 = —	b_5 = —	b_5 = 10	b_5 = 20	
Other-Sustained b_6 = 15	b_6 = 10	b_6 = —	b_6 = —	b_6 = 20	b_6 = 20	
(Total = 100%)	(Total = 100%)	(Total = 100%)	(Total = 100%)	(Total = 100%)	(Total = 100%)	
Mission Sub-Objective	Project Worth*	Project Worth*	Project Worth*	Project Worth*	Project Worth*	
Europe-Initial w_1 = 90	w_1 = 100	w_1 = 90	w_1 = 90	w_1 = 100	w_1 = 80	
Europe-Sustained w_2 = 90	w_2 = 100	w_2 = 90	w_2 = 80	w_2 = 90	w_2 = 80	
USA-Initial w_3 = 75	w_3 = —	w_3 = —	w_3 = 65	w_3 = 85	w_3 = —	
USA-Sustained w_4 = 25	w_4 = —	w_4 = —	w_4 = 20	w_4 = 30	w_4 = —	
Other-Initial w_5 = 90	w_5 = 100	w_5 = —	w_5 = —	w_5 = 90	w_5 = 90	
Other-Sustained w_6 = 90	w_6 = 100	w_6 = —	w_6 = —	w_6 = 70	w_6 = 80	
*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)	mpare project bution" Project.)	mpare project bution" Project.)	mpare project bution" Project.)	mpare project bution" Project.)	mpare project bution" Project	
B_c/SPA=						
	)N)	)N)	)N)	N)	)N)	

Figure 10. Hypothetical ratings for Project Number 342 from Table 1.

Rater's Initials: _____

Date: _____ Day/mo/yr

Rater's Office: (check one)

☐ ACE (1) ☐ DCSLOG (6)
☐ COA (2) ☐ DCSOPS (7)
☐ TAG (3) ☐ DCSPER (8)
☐ TSG (4) ☐ DCSRDA (9)
☐ ACSI (5) ☐ ACSAC (0)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
FT. BENNING	342	TACTICAL EQUIPMENT SHOPS

PRIOR RATING RESULTS

(as of 22/9/81)

r VALUES

Low Q	Median	High Q
87.5	90	100

b VALUES

Low Q	Median	High Q
17.5	27.5	52.5
13.75	20	35
0	5	16.25
0	10	31.25
0	7.5	20
0	12.5	20

w VALUES

Low Q	Median	High Q
80	90	100
80	90	92.5
0	32.5	77.5
0	10	26.25
0	85	92.5
0	75	92.5

Note: Feedback values for each r,b, and w are independent of all other r,b,and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Project Relevance to Readiness (%)

r= _____

Mission Sub-Objective	Relative Contribution of Project to each Sub-Objective (%)
Europe-Initial	b_1= _____
Europe-Sustained	b_2= _____
USA-Initial	b_3= _____
USA-Sustained	b_4= _____
Other-Initial	b_5= _____
Other-Sustained	b_6= _____

(Total =100%)

Mission Sub- Objective	Project Worth*
Europe-Initial	w_1= _____
Europe-Sustained	w_2= _____
USA-Initial	w_3= _____
USA-Sustained	w_4= _____
Other-Initial	w_5= _____
Other-Sustained	w_6= _____

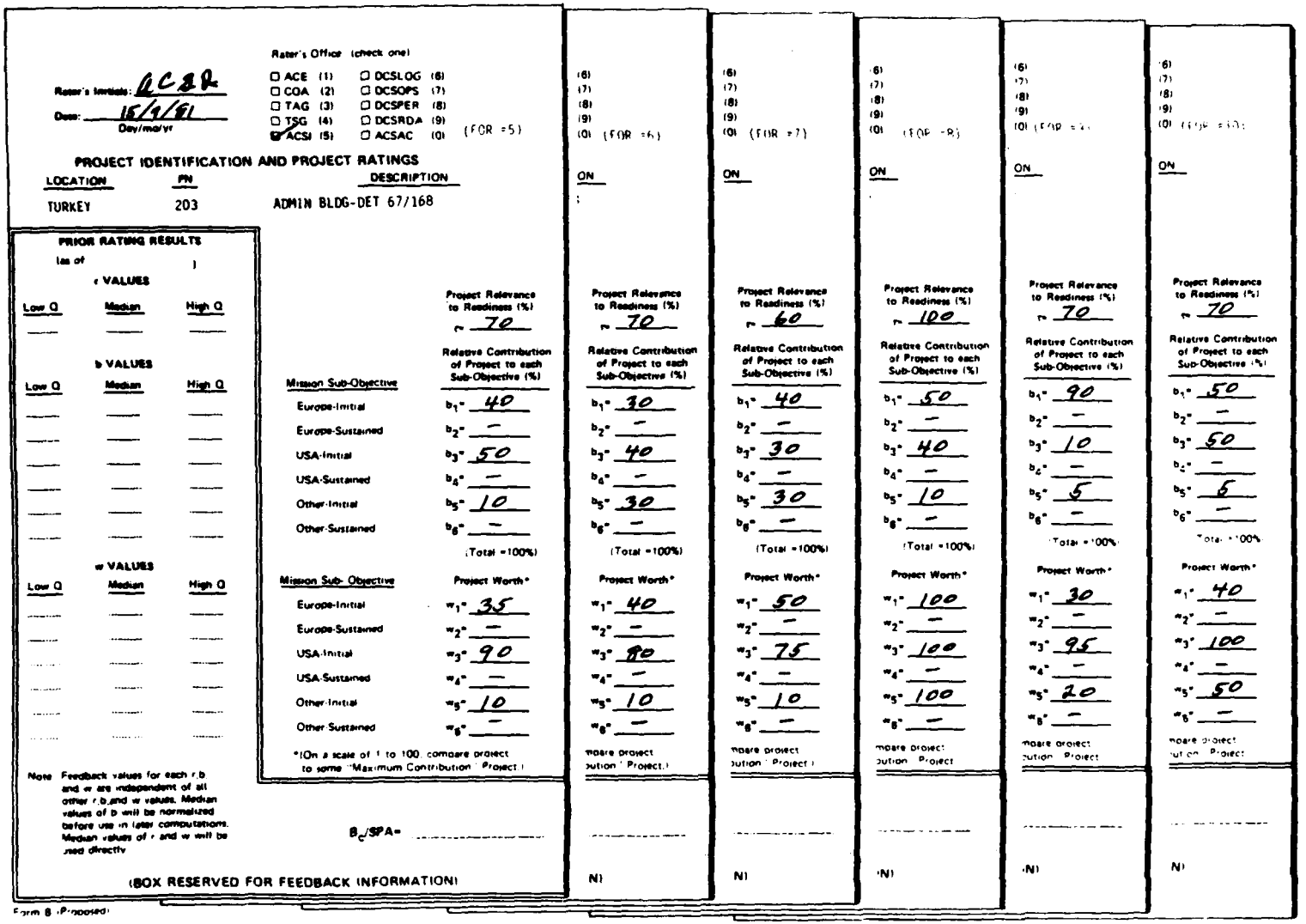
*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)

$B_C/\$PA$= 15.17

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form B (Proposed)

Figure 11. Feedback results for the values in Figure 10.



Rater's Initials: ACSAC
Date: 15/9/81 (Day/mo/yr)

Rater's Office (check one)
☐ ACE (1) ☐ DCSLOG (6)
☐ COA (2) ☐ DCSOPS (7)
☐ TAG (3) ☐ DCSPER (8)
☐ TSG (4) ☐ DCSRDA (9)
☒ ACSI (5) ☐ ACSAC (0) (FOR =5)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
TURKEY	203	ADMIN BLDG-DET 67/168

PRIOR RATING RESULTS
(as of)

r VALUES

Low Q	Median	High Q
—	—	—

b VALUES

Low Q	Median	High Q
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

w VALUES

Low Q	Median	High Q
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

Note: Feedback values for each r, b and w are independent of all other r, b, and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Mission Sub-Objective	Project Relevance to Readiness (%) r =	Relative Contribution of Project to each Sub-Objective (%)	Project Worth*
	70		
Europe-Initial		b_1 = 40	w_1 = 35
Europe-Sustained		b_2 = —	w_2 = —
USA-Initial		b_3 = 50	w_3 = 90
USA-Sustained		b_4 = —	w_4 = —
Other-Initial		b_5 = 10	w_5 = 10
Other-Sustained		b_6 = —	w_6 = —
		(Total =100%)	

*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)

B_c/SPA = _____

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form 8 (Proposed)

Mission Sub-Objective	Project Relevance to Readiness (%) r =	Relative Contribution of Project to each Sub-Objective (%)	Project Worth*
	70		
Europe-Initial		b_1 = 30	w_1 = 40
Europe-Sustained		b_2 = —	w_2 = —
USA-Initial		b_3 = 40	w_3 = 80
USA-Sustained		b_4 = —	w_4 = —
Other-Initial		b_5 = 30	w_5 = 10
Other-Sustained		b_6 = —	w_6 = —
		(Total =100%)	

Mission Sub-Objective	Project Relevance to Readiness (%) r =	Relative Contribution of Project to each Sub-Objective (%)	Project Worth*
	60		
Europe-Initial		b_1 = 40	w_1 = 50
Europe-Sustained		b_2 = —	w_2 = —
USA-Initial		b_3 = 30	w_3 = 75
USA-Sustained		b_4 = —	w_4 = —
Other-Initial		b_5 = 30	w_5 = 10
Other-Sustained		b_6 = —	w_6 = —
		(Total =100%)	

Mission Sub-Objective	Project Relevance to Readiness (%) r =	Relative Contribution of Project to each Sub-Objective (%)	Project Worth*
	100		
Europe-Initial		b_1 = 50	w_1 = 100
Europe-Sustained		b_2 = —	w_2 = —
USA-Initial		b_3 = 40	w_3 = 100
USA-Sustained		b_4 = —	w_4 = —
Other-Initial		b_5 = 10	w_5 = 100
Other-Sustained		b_6 = —	w_6 = —
		(Total =100%)	

Mission Sub-Objective	Project Relevance to Readiness (%) r =	Relative Contribution of Project to each Sub-Objective (%)	Project Worth*
	70		
Europe-Initial		b_1 = 90	w_1 = 30
Europe-Sustained		b_2 = —	w_2 = —
USA-Initial		b_3 = 10	w_3 = 95
USA-Sustained		b_4 = —	w_4 = —
Other-Initial		b_5 = 5	w_5 = 20
Other-Sustained		b_6 = —	w_6 = —
		(Total =100%)	

Mission Sub-Objective	Project Relevance to Readiness (%) r =	Relative Contribution of Project to each Sub-Objective (%)	Project Worth*
	70		
Europe-Initial		b_1 = 50	w_1 = 40
Europe-Sustained		b_2 = —	w_2 = —
USA-Initial		b_3 = 50	w_3 = 100
USA-Sustained		b_4 = —	w_4 = —
Other-Initial		b_5 = 5	w_5 = 50
Other-Sustained		b_6 = —	w_6 = —
		(Total =100%)	

Figure 12. Hypothetical ratings for Project Number 203 from Table 1.

Rater's Initials: _____

Date: _____ Day/mo/yr

Rater's Office: (check one)

☐ ACE (1)	☐ DCSLOG (6)
☐ COA (2)	☐ DCSOPS (7)
☐ TAG (3)	☐ DCSPER (8)
☐ TSG (4)	☐ DCSRDA (9)
☐ ACSI (5)	☐ ACSAC (0)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
TURKEY	203	ADMIN BLDG-DET 67/168

PRIOR RATING RESULTS

(as of 22/9/81)

r VALUES

Low Q	Median	High Q
67.5	70	72.5

b VALUES

Low Q	Median	High Q
37.5	45	60
—	—	—
25	40	50
—	—	—
5	10	30
—	—	—

w VALUES

Low Q	Median	High Q
33.75	40	62.5
—	—	—
79.75	92.5	100
—	—	—
10	15	62.5
—	—	—

Note: Feedback values for each r,b, and w are independent of all other r,b,and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Project Relevance to Readiness (%)

r= _____

Mission Sub-Objective	Relative Contribution of Project to each Sub-Objective (%)
Europe-Initial	b_1= _____
Europe-Sustained	b_2= _____
USA-Initial	b_3= _____
USA-Sustained	b_4= _____
Other-Initial	b_5= _____
Other-Sustained	b_6= _____

(Total =100%)

Mission Sub- Objective	Project Worth*
Europe-Initial	w_1= _____
Europe-Sustained	w_2= _____
USA-Initial	w_3= _____
USA-Sustained	w_4= _____
Other-Initial	w_5= _____
Other-Sustained	w_6= _____

*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)

$B_c/\$PA$= 7.60

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form B (Proposed)

Figure 13. Feedback results for the values in Figure 12.

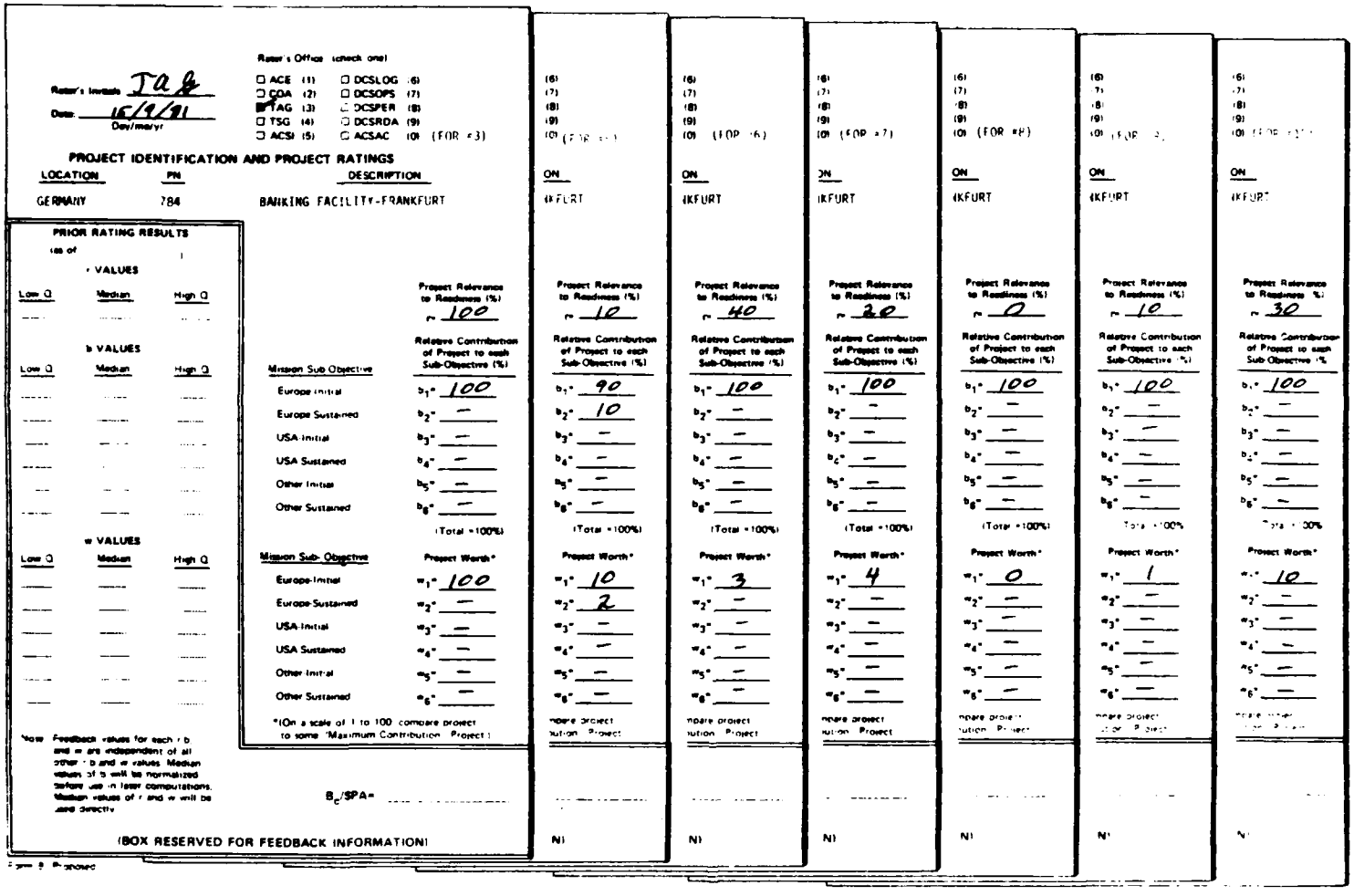


Figure 14. Hypothetical ratings for Project Number 784 from Table 1.

Rater's Initials: _____

Date: _____
Day/mo/yr

Rater's Office: (check one)

☐ ACE (1)	☐ DCSLOG (6)
☐ COA (2)	☐ DCSOPS (7)
☐ TAG (3)	☐ DCSPER (8)
☐ TSG (4)	☐ DCSRDA (9)
☐ ACSI (5)	☐ ACSAC (0)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION	PN	DESCRIPTION
GERMANY	784	BANKING FACILITY-FRANKFURT

PRIOR RATING RESULTS

(as of 22/9/81)

r VALUES

Low Q	Median	High Q
10	20	40

b VALUES

Low Q	Median	High Q
100	100	100
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

w VALUES

Low Q	Median	High Q
1	4	10
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–

Note: Feedback values for each r,b, and w are independent of all other r,b,and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Project Relevance to Readiness (%)

r= _____

Mission Sub-Objective	Relative Contribution of Project to each Sub-Objective (%)
Europe-Initial	b_1= _____
Europe-Sustained	b_2= _____
USA-Initial	b_3= _____
USA-Sustained	b_4= _____
Other-Initial	b_5= _____
Other-Sustained	b_6= _____

(Total =100%)

Mission Sub- Objective	Project Worth*
Europe-Initial	w_1= _____
Europe-Sustained	w_2= _____
USA-Initial	w_3= _____
USA-Sustained	w_4= _____
Other-Initial	w_5= _____
Other-Sustained	w_6= _____

*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)

$B_c/\$PA$= 0.29

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form 8 (Proposed)

Figure 15. Feedback results for the values in Figure 14.

2. Enter the decimal equivalent of each ratio in the appropriate box of the STEP 1 TABLE on Form A1 (Figure 16). Carry fractions out to two decimal places.

3. If one or more of the raters do not submit ratings, *cross out* the appropriate column(s) of boxes in the STEP 1 TABLE of Form A1. (This is very important.)

4. Use the statistical analysis program described in Appendix B to compute the low quartile, median, and high quartile values for each row of the STEP 1 TABLE matrix.

5. Record these three values in the appropriate row of the STEP 2 TABLE on Form A1 and on a blank copy of Form A (as feedback information).

6. Use the m_i to a_j program in Appendix C to compute the values a_1 through a_6. The input to this program is the median column of values in the STEP 2 TABLE on Form A1.

7. Record the output (a_1 through a_6) of that program on Form A in the STEP 3 TABLE of Form A1 and on Form C for later use.

Figure 17 shows the STEP 1 TABLE results for the data in Figure 3. Figure 18 shows the a_1 through a_6 values from the STEP 3 TABLE of Form A1 entered onto Form C.

Form B Data

This section describes how to process the data entered by raters on the right side of the Form B data sheets. Each project will have six to 10 Form B rating sheets to be processed. The six example rating sheets for Project Number 414 shown in Figure 6 are used below as an example of how to process Form B data:

1. Transfer each value from each Form B to the appropriate box on the Form B1 worksheet (Figure 19).

2. If one or more of the raters does not submit ratings, *cross out* that column(s) on Form B1 for that rater(s). (This is very important.)

3. Use the statistical analysis program described in Appendix B to compute the low quartile, median, and upper quartile values for rows r, b_1 through b_6, and w_1 through w_6 on Form B1. If a box is *crossed off* do *not* include it in the set of numbers being processed for that row. However, *blank* boxes are equivalent to *zero entries* for processing purposes.

4. Enter the results of processing the Form B1 data on Form B2 (Figure 20). Also enter the respective project number on Form B2.

5. Enter these results in the feedback section of Form B along with the project identification information for the respective project.

6. Enter the decimal form of the median r value, the normalized b′ values, and the decimal form of the median w values in the correct boxes on Form C.

7. Enter the project number at the bottom of Form C.

Figure 21 is an example of a Form B1 filled in with values from Figure 6. Figure 22 shows the data from Figure 21 after being processed and recorded on Form B2.

Form C Instructions

For each project, certain data from Forms A1 and B2 are transferred to Form C:

1. Take the values a_1 through a_6 from the most recent mission weight evaluation that was done, i.e., from the STEP 3 TABLE of the most recent Form A1 data sheet. Each a_i should have a value between 0 and 100. If not, an error has been made.

2. Use the same a_1 through a_6 values for every project. The a_i values in Figure 18 were taken from Figure 17.

3. The b′, w, and r values in Columns 2, 3, and 4 of Form C vary from project to project; therefore, enter the appropriate project number on *each* Form C.

4. Use the decimal form of the median r values (not the % form). Take this value from the STEP 1 TABLE of the most recent Form B2 computation for that project.

5. Take the values b_1' through b_6' from the STEP 3 TABLE of the most recently created Form B2; the values w_1 through w_6 are the decimal form of the median values from the STEP 4 TABLE. These r, b′, and w variables can have values from 0 to 1. If they do not, an error has been made.

PROCESSING INSTRUCTIONS FOR FORM "A" INPUT DATA

Initials:_____ Date Processed:_____

STEP 1: Enter into the respective box below the decimal equivalent (to the nearest 0.01) of each ratio from basic input Form A.

STEP 1 TABLE

	ACE (1)	COA (2)	TAG (3)	TSG (4)	ACSI (5)	DCSLOG (6)	DCSOPS (7)	DCSPER (8)	DCSRDA (9)	ACSAC (0)
EUR/USA										
OTH/USA										
EUR: I/S										
USA: I/S										
OTH: I/S										

STEP 2: Using the program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for each row of numbers above and record results in the Step 2 table below and on Form A (as feedback information.)

STEP 3: Using the program, "m_i to a_j," compute a_1 through a_6 (to the nearest 0.01) and record the six values on Form A (as feedback information), in Step 3 table below, and on Form C.

STEP 2 TABLE

ROW	OBJECTIVE	LOW Q	MEDIAN	HIGH Q
1	EUR/USA	l_1:	m_1:	h_1:
2	OTH/USA	l_2:	m_2:	h_2:
3	EUR:I/S	l_3:	m_3:	h_3:
4	USA:I/S	l_4:	m_4:	h_4:
5	OTH:I/S	l_5:	m_5:	h_5:

STEP 3 TABLE

MISSION WEIGHTS
a_1:
a_2:
a_3:
a_4:
a_5:
a_6:

Form A1 (Proposed)

Figure 16. Form A1.

PROCESSING INSTRUCTIONS FOR FORM "A" INPUT DATA

Initials: J.D Date Processed: 22/9/81

STEP 1: Enter into the respective box below the decimal equivalent (to the nearest 0.01) of each ratio from basic input Form A.

STEP 1 TABLE

	ACE (1)	COA (2)	TAG (3)	TSG (4)	ACSI (5)	DCSLOG (6)	DCSOPS (7)	DCSPER (8)	DCSRDA (9)	ACSAC (0)
EUR/USA	4		3	3	2	2	4		50	
OTH/USA	2		2	1	0.1	2	2		10	
EUR: I/S	2		2.67	7	2	4	6		2	
USA: I/S	0.5		2.25	1.25	0.5	0.33	2		1.25	
OTH: I/S	1.33		3	1	3	0.33	4		4	

STEP 2: Using the program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for each row of numbers above and record results in the Step 2 table below and on Form A (as feedback information.)

STEP 3: Using the program, "m_i to a_j," compute a_1 through a_6 (to the nearest 0.01) and record the six values on Form A (as feedback information), in Step 3 table below, and on Form C.

STEP 2 TABLE

ROW	OBJECTIVE	LOW Q	MEDIAN	HIGH Q
1	EUR/USA	l_1: 2	m_1: 3	h_1: 4
2	OTH/USA	l_2: 1	m_2: 2	h_2: 2
3	EUR:I/S	l_3: 2	m_3: 2.67	h_3: 6
4	USA:I/S	l_4: 0.5	m_4: 1.25	h_4: 2
5	OTH:I/S	l_5: 1	m_5: 3	h_5: 4

STEP 3 TABLE

MISSION WEIGHTS
a_1: 36.38
a_2: 13.62
a_3: 9.26
a_4: 7.41
a_5: 26.00
a_6: 8.33

Form A1 (Proposed)

Figure 17. STEP 1 TABLE results for the data in Figure 3.

PROJECT B/C COMPUTATION SHEET

Compute the Benefit Cost Ratios $(b/c)_1$ through $(b/c)_6$ by multiplying the values in the boxes. Blank boxes equal zero. Sum the six $(b/c)_i$ ratios to get $B_R/\$PA$.

Initials: JP

Date Processed: 22/9/81

RELATIVE IMPORTANCE (a_i) OF MISSION SUB OBJECTIVE		RELATIVE CONTRIBUTION (b_i') TO MISSION SUB OBJECTIVE (Normalized)		RELATIVE PROJECT WORTH (w_i) WITHIN SUB OBJECTIVE		PROJECT RELEVANCE (r) TO FORCE READINESS		
36.38	(a_1)	0.7	(b_1')	1.0	(w_1)	1.0	(r)	= 25.47 $(b/c)_1$
13.62	(a_2)	0.3	(b_2')	0.55	(w_2)	1.0	(r)	= 2.25 $(b/c)_2$
9.26	(a_3)	0	(b_3')	0	(w_3)	1.0	(r)	= 0 $(b/c)_3$
7.41	(a_4)	0	(b_4')	0	(w_4)	1.0	(r)	= 0 $(b/c)_4$
25.0	(a_5)	0	(b_5')	0	(w_5)	1.0	(r)	= 0 $(b/c)_5$
8.33	(a_6)	0	(b_6')	0	(w_6)	1.0	(r)	= 0 $(b/c)_6$

(SUM TO GET $B_R/\$PA$)

PN: 414

SUM= 27.72 (Enter on Form B) = $B_R/\$PA$

Form C (Proposed)

Figure 18. Form C filled in with values from Forms A1 and B1.

PROCESSING INSTRUCTIONS FOR FORM "B" INPUT DATA

PN: _____ Initials: _____ Date Processed: _____

	ACE	COA	TAG	TSG	ACSI	DCSLOG	DCSOPS	DCSPER	DCSRDA	ACSAC
r:										
b_1:										
b_2:										
b_3:										
b_4:										
b_5:										
b_6:										
w_1:										
w_2:										
w_3:										
w_4:										
w_5:										
w_6:										

Transfer the individual ratings from Forms B to the respective boxes above. Cross out (x) any columns for which no ratings were made. Continue processing on Form B2.

Form B1 (Proposed)

Figure 19. Form B1.

PROCESSING INSTRUCTIONS FOR FORM "B-1" DATA

PN: _____ Initials: _____ Date Processed: _____

STEP 1: Using program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for the "r" values on Form B-1. Enter results here and on Form "B" (as feedback information.)

r: Low Q. _____ (%) Median _____ (%) High Q. _____ (%)

Enter the decimal form of the Median Value of "r" on Form C in six places.

STEP 2: Using the program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for rows b_1 through b_6 on Form B 1 and enter results in the Step 2 table below and on Form B (as feedback information.)

STEP 3: Using the program "Normalize b_i," compute the decimal form of the normalized values of b_i and enter them in the Step 3 table below and on the B/C Computation sheet, Form C.

STEP 2 TABLE

	Low Q (%)	Median (%)	High Q (%)
b_1:			
b_2:			
b_3:			
b_4:			
b_5:			
b_6:			

STEP 3 TABLE

Normalized Median	
b'_1	
b'_2	
b'_3	
b'_4	
b'_5	
b'_6	

STEP 4: Using program "Statistical Analysis" compute the Low Quartile, Median, and High Quartile values for rows w_1 through w_6 of Form B-1. Enter results in the Step 4 table below and on Form "B" (as feedback information.) Enter the decimal form of the Median w_i values on the B/C Computation sheet, Form C.

STEP 4 TABLE

	Low Q (%)	Median (%)	High Q (%)
w_1:			
w_2:			
w_3:			
w_4:			
w_5:			
w_6:			

Form B2 (Proposed)

Figure 20. Form B2.

PROCESSING INSTRUCTIONS FOR FORM "B" INPUT DATA

PN: 414 Initials: JB Date Processed: 22/9/81

	ACE	COA	TAG	TSG	ACSI	DCSLOG	DCSOPS	DCSPER	DCSRDA	ACSAC
r:	X	X	X	X	100	100	90	100	100	100
b_1:	X	X	X	X	60	70	70	85	90	30
b_2:	X	X	X	X	40	30	30	15	10	60
b_3:	X	X	X	X						
b_4:	X	X	X	X						
b_5:	X	X	X	X						
b_6:	X	X	X	X						
w_1:	X	X	X	X	90	100	100	100	100	75
w_2:	X	X	X	X	50	100	60	40	30	100
w_3:	X	X	X	X						
w_4:	X	X	X	X						
w_5:	X	X	X	X						
w_6:	X	X	X	X						

Transfer the individual ratings from Forms B to the respective boxes above. Cross out (x) any columns for which no ratings were made. Continue processing on Form B2.

Form B1 (Proposed)

Figure 21. Form B1 filled in with values from Figure 6.

PROCESSING INSTRUCTIONS FOR FORM "B-1" DATA

PN 414 Initials: JO Date Processed: 22/9/81

STEP 1 Using program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for the "r" values on Form B-1. Enter results here and on Form "B" (as feedback information.)

r: Low Q 97.5 (%) Median 100 (%) High Q 100 (%)

Enter the decimal form of the Median Value of "r" on Form C in six places.

STEP 2: Using the program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for rows b_1 through b_6 on Form B-1 and enter results in the Step 2 table below and on Form B (as feedback information.)

STEP 3. Using the program "Normalize b_i," compute the decimal form of the normalized values of b_i and enter them in the Step 3 table below and on the B/C Computation sheet, Form C.

STEP 2 TABLE

	Low Q (%)	Median (%)	High Q (%)
b_1	52.5	70	86.25
b_2	13.75	30	45
b_3	-	-	-
b_4	-	-	-
b_5	-	-	-
b_6	-	-	-

STEP 3 TABLE

	Normalized Median
b'_1	0.70
b'_2	0.30
b'_3	-
b'_4	-
b'_5	-
b'_6	-

STEP 4: Using program "Statistical Analysis" compute the Low Quartile, Median, and High Quartile values for rows w_1 through w_6 of Form B-1. Enter results in the Step 4 table below and on Form "B" (as feedback information.) Enter the decimal form of the Median w_i values on the B/C Computation sheet, Form C.

STEP 4 TABLE

	Low Q (%)	Median (%)	High Q (%)
w_1	86.25	100	100
w_2	37.5	55	100
w_3	-	-	-
w_4	-	-	-
w_5	-	-	-
w_6	-	-	-

Form B2 (Proposed)

Figure 22. Data from Figure 21 transferred to Form B2.

6. After all values are entered, compute the values $(b/c)_1$ through $(b/c)_6$ as the simple product of the numbers in the boxes in each row. Record these values on Form C to the nearest hundredth (0.00).

7. Sum the values $(b/c)_1$ through $(b/c)_6$ to get $B_R/C = B_R/\$PA$. Enter this sum at the bottom of Form C and at the bottom of Form B. The b', w, and r data from Figure 22 were processed in this manner; the results are shown in Figure 18 and in Figure 7.

Data Processing Exercise

The reader is encouraged to process the data from Figures 8, 10, 12, and 14. The correct $B_R/\$PA$ ratios for these data are shown in Figures 9, 11, 13, and 15, respectively.

4 CONCLUSION

The Facilities Readiness Quantification Model can be used to determine the relative readiness merits of selected MCA programs. If the model is to provide accurate results, at least six raters must participate. Rater data can be processed either manually, or by using the model algorithms on a programmable calculator.

GLOSSARY

a_i:	mission weight of the i^{th} mission.
B_R:	benefits to readiness.
B/C:	benefit/cost.
b_i:	the fractional portion of a project's benefits that are assigned to the i^{th} mission (expressed as a decimal).
C_R:	that part of the cost of a funding entity attributable to readiness.
C_T:	the estimated total cost of a funding entity.
CERL:	U.S. Army Construction Engineering Research Laboratory.
COA:	Controller of the Army.
COE:	Chief of Engineers.
CRRC:	Construction Requirements Review Committee.
DCSLOG:	Deputy Chief of Staff, Logistics.
DCSPER:	Deputy Chief of Staff, Personnel.
EUSA:	Eighth U.S. Army.
FR:	force readiness.
m_j	the fractional part of the cost of the j^{th} funding entity that does not buy readiness benefits. Note: m_j also can be described as the "complement of r_j."
MCA:	Military Construction, Army (appropriation)
r_j:	the fractional part of the cost of the j^{th} funding entity that does buy readiness benefits.
STD:	standard (maximum contribution standard).
TAG:	The Adjutant General.
TI:	Texas Instruments Corporation.
TRADOC:	Training and Doctrine Command.
TSG:	The Surgeon General.
USAREUR:	U.S. Army, Europe.
$(w_i)_j$:	the relative worth of the j^{th} funding entity when compared to the maximum contribution standard for the i^{th} mission area.
\$PA:	dollars, programmed amount.

APPENDIX A:
GENERAL INFORMATION ON THE TI-59 CALCULATOR*

Placing the TI-59 Calculator into Operation

The instructions in this appendix and Appendices B through D assume the user has access to a Texas Instruments (TI)-59 programmable calculator, a TI PC-100C print cradle, a TI Math Module, TI-59 magnetic cards, and the TI manuals listed below. (The system is shown in Figure A1.)

Personal Programming - A Complete Owner's Manual for TI Programmable 58/59 (Texas Instruments Corporation, 1977).

Math/Utilities - Using the Power of Your Solid State Software Module (Texas Instruments Corporation, 1978).

Texas Instruments–Print/Security Cradle PC-100 C (Texas Instruments Corporation, 1978).

First ensure that a TI math module is installed in the TI-59 calculator. Next, store the dust cover for the PC-100 calculator mounting bracket in the right side of the storage compartment on the PC-100 printer. Remove the battery pack from the calculator and put it into the left side of the storage compartment. The battery pack fits only one way. The flat side should face up and the slot should be to the left.

Put the key in the PC-100 lock and turn it fully counterclockwise. Then put the TI-59 on the mounting bracket and press down and toward the back of the PC-100. Hold the calculator in this position and turn the key a half turn clockwise to lock the calculator in place. If the calculator is correctly positioned, the key should turn easily (see Figure A1). Connect the printer to a standard 115-V outlet. Slide the switch on the right side of the printer to the rear to turn the printer on. Then turn the calculator itself on by putting the on/off switch in the "on" position. Both instruments must be "on" for the system to work. The programs listed in Appendices B, C, and D will not work without the printer attached to the calculator.

Recording a Program

Once the calculator is operational, any of the programs listed in Appendices B, C, and D of this report can be keyed-in. Only *one* of these programs should be stored at a time in the calculator, because all three programs use some of the same label keys. Certain *program data* also must be entered for the statistical analysis program described in Appendix B.

It is advisable to record all programs on magnetic cards so they will not have to be keyed-in each time they are needed.

*The instructions given in this appendix and Appendices B through D assume the user implements the program on a Texas Instruments (TI)-59 calculator. However, the algorithms described in this report can be adapted to programs for similar programmable calculators.

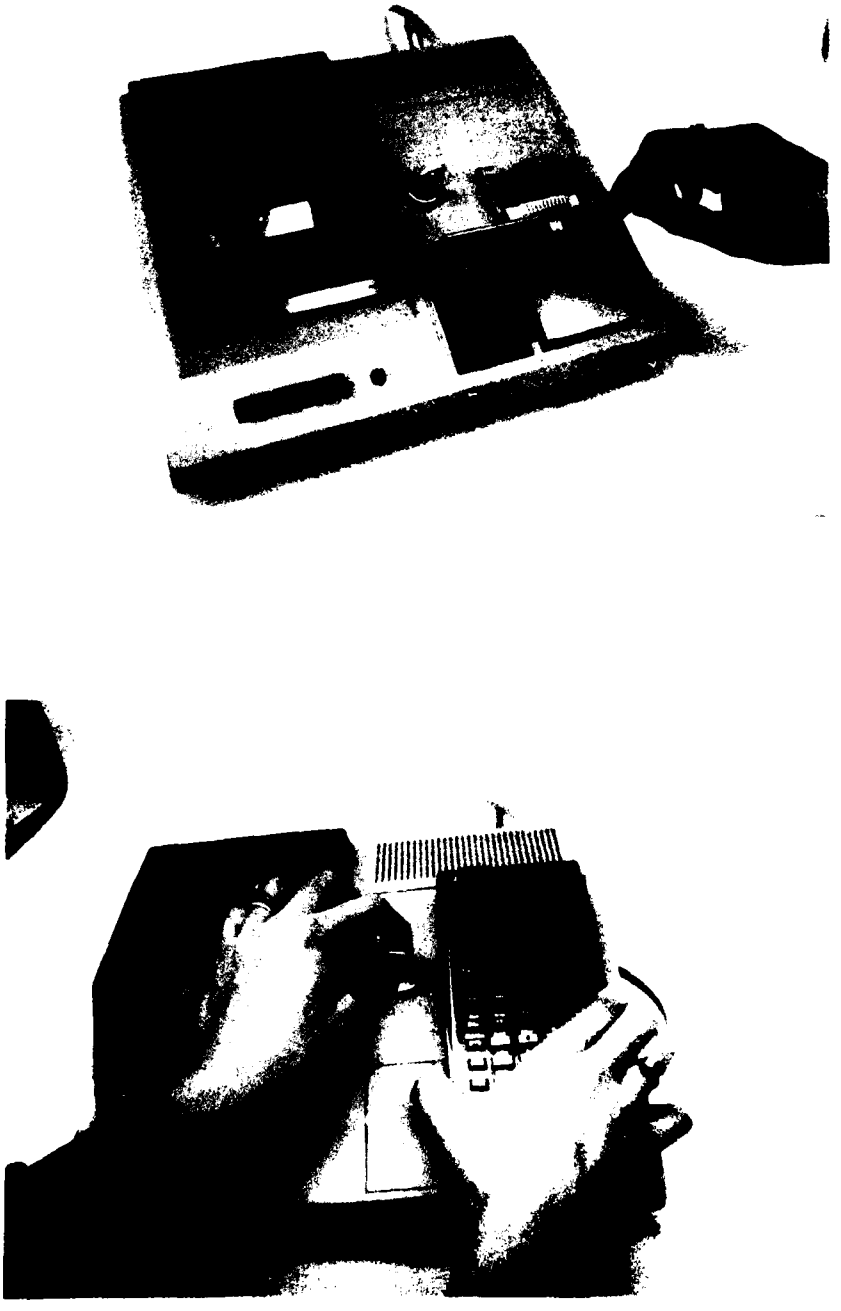


Figure A1. TI-59 system.

APPENDIX B: STATISTICAL ANALYSIS PROGRAM

Using the Program

This appendix describes how to use the statistical analysis program after the program steps and program data have been entered into the calculator (as described in Appendix A). Figure B1 shows how to use the program to process the first line of data in Figure 17. The resulting printout is keyed to each step of the process. Figure B2 shows how the first line of data in Figure 21 would be processed. The program actually can be used to find the quartile value of a sequence of up to 32 input values. If more than 32 values are input, however, some of the program data in registers 33 and beyond will be erased. This will adversely affect the printout messages. On the other hand, at least *three* values must be input for the program to work correctly. Each row of data in Figures 17 and 21 would be processed separately, following steps 1 through 3 of Figures B1 or B2 for each row of data.

Program Steps/Data Required

Before using the statistical analysis program, the TI-59 steps in Figure B3 must be entered into calculator memory, and the data in Figure B4 must be entered into data storage registers 33 to 59. Note: this program also requires that the math module be in the calculator at the time the program is executed.

Algorithms Used

This section describes the algorithm for determining the low quartile values (V_l), the median value (V_m), and the high quartile value (V_h) for a sequence of numbers. First, the N input values (V_i) are sorted into low to high sequence (V_1 to V_n). Then, $l = (n+1)/4$ is assigned as the low quartile index number; $m = (n+1)/2$ is assigned as the median index number; and $h = (n+1)(3/4)$ is assigned as the high quartile index number. These three index numbers–l, m, and h–are *all integers only* when N = 3, 7, 11, 15, 19, 23, . . . etc. For all other values of N, some of the index numbers will have a fractional component. For these cases, the index numbers (l, m, or h) are separated into two parts–an integer part (i) and a decimal part (0.d). The quartile *value* being computed is the value of the i^{th} number plus the quantity (0.d) $(V_{i+1} - V_i)$. The manual use of this algorithm is demonstrated in Figures B5 and B6.

Problem Statement: Compute the low quartile value (V_l), the median value (V_m), and the high quartile value (V_h) for the first row of data in Figure 17, i.e., for input values of 4, 3, 3, 2, 2, 4, and 50.

STEP	PROCEDURE	ENTER	PRESS	TI-59 DISPLAY	PC-100 PRINTER
1	Initialize the program		RST E	 0.	ENTER VALUE, PRESS A (FOR EACH VALUE) . . . THEN PRESS B TO COM-
2	Enter each input value and press A in turn for each value entered	4	A	4.	PUTE. . . DO THIS NOW!
		3	A	3.	4.
		3	A	3.	3.
		2	A	2.	3.
		2	A	2.	2.
		4	A	4.	2.
		50	A	50.	4.
					50.
3	Compute/output answers		B		COMPUTING. . . WAIT!
					LOW Q VALUE=
					2.
					MEDIAN VALUE=
					3.
					TOP Q VALUE =
				4.	4.

Figure B1. Example problem no. 1 for the statistical analysis program.

Problem Statement: Compute the low quartile value (V_l), the median value (V_m), and the high quartile value (V_h) for the first row of data in Figure 21, i.e., for input values of 100, 100, 90, 100, 100, and 100.

STEP	PROCEDURE	ENTER	PRESS	TI-59 DISPLAY	PC-100 PRINTER
1	Initialize the program		RST E	0.	ENTER VALUE, PRESS A (FOR EACH VALUE) . . . THEN PRESS B TO COM-
2	Enter each input value and press A in turn for each value entered	100	A	100.	PUTE. . . DO THIS NOW!
		100	A	100.	100.
		90	A	90.	100.
		100	A	100.	90.
		100	A	100.	100.
		100	A	100.	100.
					100.
3	Compute/output answers		B		COMPUTING. . . WAIT!
					LOW Q VALUE=
					97.5
					MEDIAN VALUE=
					100.
					TOP Q VALUE=
				100.	100.

Figure B2. *Example problem no. 2 for the statistical analysis program.*

```
000  76 LBL
001  11  A
002  99 PRT
003  36 PGM
004  06  06
005  11  A
006  91 R/S
007  76 LBL
008  13  C
009  36 PGM
010  06  06
011  13  C
012  25 CLR
013  91 R/S
014  76 LBL
015  15  E
016  03  3
017  69 DP
018  17  17
019  47 CMS
020  06  6
021  69 DP
022  17  17
023  00  0
024  42 STO
025  30  30
026  42 STO
027  31  31
028  42 STO
029  32  32
030  68 NOP
031  68 NOP
032  68 NOP
033  25 CLR
034  29 CP
035  69 DP
036  00  00
037  43 RCL
038  45  45
039  69 DP
040  01  01
041  43 RCL
042  46  46
043  69 DP
044  02  02
045  43 RCL
046  47  47
047  69 DP
048  03  03
049  43 RCL
050  33  33
051  69 DP
052  04  04
053  69 DP
054  05  05
055  69 DP
056  00  00
057  43 RCL
058  34  34
059  69 DP
060  01  01
061  43 RCL
062  35  35
063  69 DP
064  02  02
065  43 RCL
066  36  36
067  69 DP
068  01  01
069  43 RCL
070  37  37
071  69 DP
072  04  04
073  69 DP
074  05  05
075  69 DP
076  00  00
077  43 RCL
078  38  38
079  69 DP
080  01  01
081  43 RCL
082  39  39
083  69 DP
084  02  02
085  43 RCL
086  40  40
087  69 DP
088  03  03
089  43 RCL
090  41  41
091  69 DP
092  04  04
093  69 DP
094  05  05
095  69 DP
096  00  00
097  43 RCL
098  42  42
099  69 DP
100  01  01
101  43 RCL
102  43  43
103  69 DP
104  02  02
105  43 RCL
106  44  44
107  69 DP
108  03  03
109  43 RCL
110  50  50
111  69 DP
112  04  04
113  69 DP
114  05  05
115  25 CLR
116  91 R/S
117  76 LBL
118  12  B
119  03  3
120  32 X:T
121  43 RCL
122  00  00
123  22 INV
124  77  GE
125  86 STF
126  29 CP
127  43 RCL
128  00  00
129  42 STO
130  23  23
131  43 RCL
132  00  00
133  85  +
134  01  1
135  54  )
136  55  ÷
137  04  4
138  54  )
139  42 STO
140  26  26
141  43 RCL
142  00  00
143  85  +
144  01  1
145  54  )
146  55  ÷
147  02  2
148  54  )
149  42 STO
150  25  25
151  43 RCL
152  26  26
153  65  ×
154  03  3
155  54  )
156  42 STO
157  24  24
158  69 DP
159  00  00
160  43 RCL
161  51  51
162  69 DP
163  01  01
164  43 RCL
165  52  52
166  69 DP
167  02  02
168  43 RCL
169  48  48
170  69 DP
171  03  03
172  43 RCL
173  49  49
174  69 DP
175  04  04
176  69 DP
177  05  05
178  36 PGM
179  06  06
180  12  B
181  76 LBL
182  14  D
183  29 CP
184  25 CLR
185  43 RCL
186  26  26
187  22 INV
188  59 INT
189  67  EQ
190  16 A'
191  43 RCL
192  26  26
193  59 INT
194  42 STO
195  27  27
196  85  +
197  01  1
198  54  )
199  42 STO
200  28  28
201  73 RC*
202  28  28
203  75  -
204  73 RC*
205  27  27
206  42 STO
207  27  27
208  54  )
209  42 STO
210  28  28
211  43 RCL
212  26  26
213  22 INV
214  59 INT
215  65  ×
216  43 RCL
217  28  28
218  85  +
219  43 RCL
220  27  27
221  54  )
222  42 STO
223  28  28
224  76 LBL
225  19 D'
226  29 CP
227  43 RCL
228  25  25
229  22 INV
230  59 INT
231  67  EQ
232  17 B'
233  43 RCL
234  25  25
235  59 INT
236  42 STO
237  29  29
238  85  +
239  01  1
240  54  )
241  42 STO
242  30  30
243  73 RC*
244  29  29
245  85  +
246  73 RC*
247  30  30
248  54  )
249  55  ÷
250  02  2
251  54  )
252  42 STO
253  30  30
254  76 LBL
255  10 E'
256  43 RCL
257  24  24
258  22 INV
259  59 INT
260  67  EQ
261  18 C'
262  43 RCL
263  24  24
264  59 INT
265  42 STO
266  31  31
267  85  +
268  01  1
269  54  )
270  42 STO
271  32  32
272  73 RC*
273  32  32
274  75  -
275  73 RC*
276  31  31
277  42 STO
278  31  31
279  54  )
280  42 STO
281  32  32
282  43 RCL
283  24  24
284  22 INV
285  59 INT
286  65  ×
287  43 RCL
288  32  32
289  85  +
290  43 RCL
291  31  31
292  54  )
293  42 STO
294  32  32
295  76 LBL
296  99 PRT
297  98 ADV
298  69 DP
299  00  00
300  43 RCL
301  53  53
302  69 DP
303  01  01
304  43 RCL
305  54  54
306  69 DP
```

Figure B3. TI-59 steps required for the statistical analysis program.

307	02	02
308	43	RCL
309	55	55
310	69	OP
311	03	03
312	43	RCL
313	56	56
314	69	OP
315	04	04
316	69	OP
317	05	05
318	43	RCL
319	28	28
320	99	PRT
321	98	ADV
322	69	OP
323	00	00
324	43	RCL
325	57	57
326	69	OP
327	01	01
328	43	RCL
329	58	58
330	69	OP
331	02	02
332	43	RCL
333	59	59
334	69	OP
335	03	03
336	01	1
337	07	7
338	06	6
339	04	4
340	00	0
341	00	0
342	00	0
343	00	0
344	00	0
345	00	0
346	69	OP
347	04	04
348	69	OP
349	05	05
350	69	OP
351	00	00
352	43	RCL
353	30	30
354	99	PRT
355	98	ADV
356	69	OP
357	00	00
358	00	0
359	00	0
360	00	0
361	00	0
362	00	0
363	00	0
364	00	0
365	00	0
366	03	3
367	07	7
368	69	OP
369	01	01
370	03	3
371	02	2
372	03	3
373	03	3
374	00	0
375	00	0
376	03	3
377	04	4
378	00	0
379	00	0
380	69	OP
381	02	02
382	43	RCL
383	55	55
384	69	OP
385	03	03
386	43	RCL
387	56	56
388	69	OP
389	04	04
390	69	OP
391	05	05
392	43	RCL
393	32	32
394	99	PRT
395	98	ADV
396	98	ADV
397	98	ADV
398	91	R/S
399	76	LBL
400	16	A'
401	43	RCL
402	26	26
403	59	INT
404	42	STO
405	27	27
406	73	RC*
407	27	27
408	42	STO
409	28	28
410	61	GTO
411	19	D'
412	76	LBL
413	17	B'
414	43	RCL
415	25	25
416	59	INT
417	42	STO
418	29	29
419	73	RC*
420	29	29
421	42	STO
422	30	30
423	61	GTO
424	10	E'
425	76	LBL
426	18	C'
427	43	RCL
428	24	24
429	59	INT
430	42	STO
431	31	31
432	73	RC*
433	31	31
434	42	STO
435	32	32
436	61	GTO
437	99	PRT
438	76	LBL
439	68	NOP
440	36	PGM
441	02	02
442	10	E'
443	22	INV
444	58	FIX
445	91	R/S
446	76	LBL
447	86	STF
448	36	PGM
449	02	02
450	15	E
451	22	.NV
452	58	FIX
453	91	R/S

Figure B3. (Cont'd).

1736360013.	33
5521323500.	34
1713152300.	35
4213274117.	36
3640404000.	37
3723173100.	38
3335173636.	39
14003732.	40
15323020.	41
3341371740.	42
4040001632.	43
37232435.	44
1731371735.	45
42132741.	46
1757003333.	47
4040431334.	48
3773000000.	49
31324373.	50
1532303341.	51
3724312240.	52
27.	53
3243003400.	54
4213274117.	55
6400000000.	56
30.	57
1716241331.	58
42132741.	59

Figure B4. Data required in data storage registers 33 to 59 for the statistical analysis program.

Problem: Determine the low quartile value (V_l), the median value (V_m), and the high quartile value (V_h) for the following numbers: 0, 22, 16, 16, 1, 5, and 0.

Step 1: Arrange numbers low to high.

i	1	2	3	4	5	6	7	(N = 7)
V_i	0	0	1	5	16	16	22	

Step 2: Compute l, m, and h.

$$l = \frac{N+1}{4} = \frac{8}{4} = 2; m = \frac{N+1}{2} = 4; h = (N+1)(3/4) = 6$$

Step 3: Compute V_l, V_m, and V_h.

$V_l = V_2 = 0$, i.e., the 2nd value in the chart;

$V_m = V_4 = 5$, i.e., the 4th value in the chart;

$V_h = V_6 = 16$, i.e., the 6th value in the chart.

Figure B5. Simple example of how quartile values are determined.

Problem: Determine the low quartile value (V_l), the median value (V_m), and the high quartile value (V_h) for the following numbers: 13.7, 12.1, 15.5, 11.5, 14.2, 8.1, 5.2, 21.3, and 15.5

Step 1: Arrange numbers low to high.

i	1	2	3	4	5	6	7	8	9 (N = 9)
V_i	5.2	8.1	11.5	12.1	13.7	14.2	15.5	15.5	21.3

Step 2: Compute l, m, and h.

$$l = \frac{N+1}{4} = 2\text{-}1/2; m = \frac{N+1}{2} = 5; h = (N+1)(3/4) = 7\text{-}1/2$$

Step 3: Compute V_l, V_m, and V_h.

$$V_l = V_{2.5} = V_2 + (0.5)(V_3 - V_2) = 8.1 + (.5)(11.5 - 8.1) = 9.8$$

$$V_m = V_5 = 13.7$$

$$V_h = V_{7.5} = V_7 + (0.5)(V_8 - V_7) = 15.5 + (0.5)(15.5 - 15.5) = 15.5$$

Figure B6. Complex example of how quartile values are determined.

APPENDIX C: m_i TO a_j PROGRAM

Using the Program

This appendix describes how to use the m_i to a_j program after the program steps have been entered into the calculator. Figure C1 shows how to use the program to process the median ratio values in the STEP 2 TABLE of Figure 17. The resulting printout is keyed to each step of the process.

Program Steps Required

Before using the m_i to a_j program, the program steps in Figure C2 must be entered into the calculator memory.

Algorithm Used

The median ratio values, m_1 through m_5, in the STEP 2 TABLE of Form A1 (see Figure 17) are converted to the mission weights, a_1 through a_6, in the STEP 3 TABLE (on the same form) according to the following algorithms:

$$a_1 = \frac{m_3}{m_3 + 1} \frac{m_1}{m_1 + m_2 + 1} \times 100 \quad [\text{Eq C1}]$$

$$a_2 = \frac{1}{m_3 + 1} \frac{m_1}{m_1 + m_2 + 1} \times 100 \quad [\text{Eq C2}]$$

$$a_3 = \frac{m_4}{m_4 + 1} \frac{1}{m_1 + m_2 + 1} \times 100 \quad [\text{Eq C3}]$$

$$a_4 = \frac{1}{m_4 + 1} \frac{1}{m_1 + m_2 + 1} \times 100 \quad [\text{Eq C4}]$$

$$a_5 = \frac{m_5}{m_5 + 1} \frac{m_2}{m_1 + m_2 + 1} \times 100 \quad [\text{Eq C5}]$$

$$a_6 = \frac{1}{m_5 + 1} \frac{m_2}{m_1 + m_2 + 1} \times 100 \quad [\text{Eq C6}]$$

Problem Statement: Compute the six values of a_j, given the five median values of m_i from the STEP 2 TABLE of Figure 17.

STEP	PROCEDURE	ENTER	PRESS	TI-59 DISPLAY	PC-100 PRINTER
1	Initialize the Program		RST E'		
2	Input m_1	3	A	3.	
3	Input m_2	2	B	2.	
4	Input m_3	2.67	C	2.67	
5	Input m_4	1.25	D	1.25	
6	Input m_5	3	E	3.	
7	Compute and Output a_i		A'		'M TO A' PROGRAM IS COMPUTING..... WAIT
					INPUT WAS :
					3.00 M1
					2.00 M2
					2.67 M3
					1.25 M4
					3.00 M5
					OUTPUT IS :
					36.38 A1
					13.62 A2
					9.26 A3
					7.41 A4
					25.00 A5
				999	8.33 A6

Figure C1. Example problem for the m_i to a_j program.

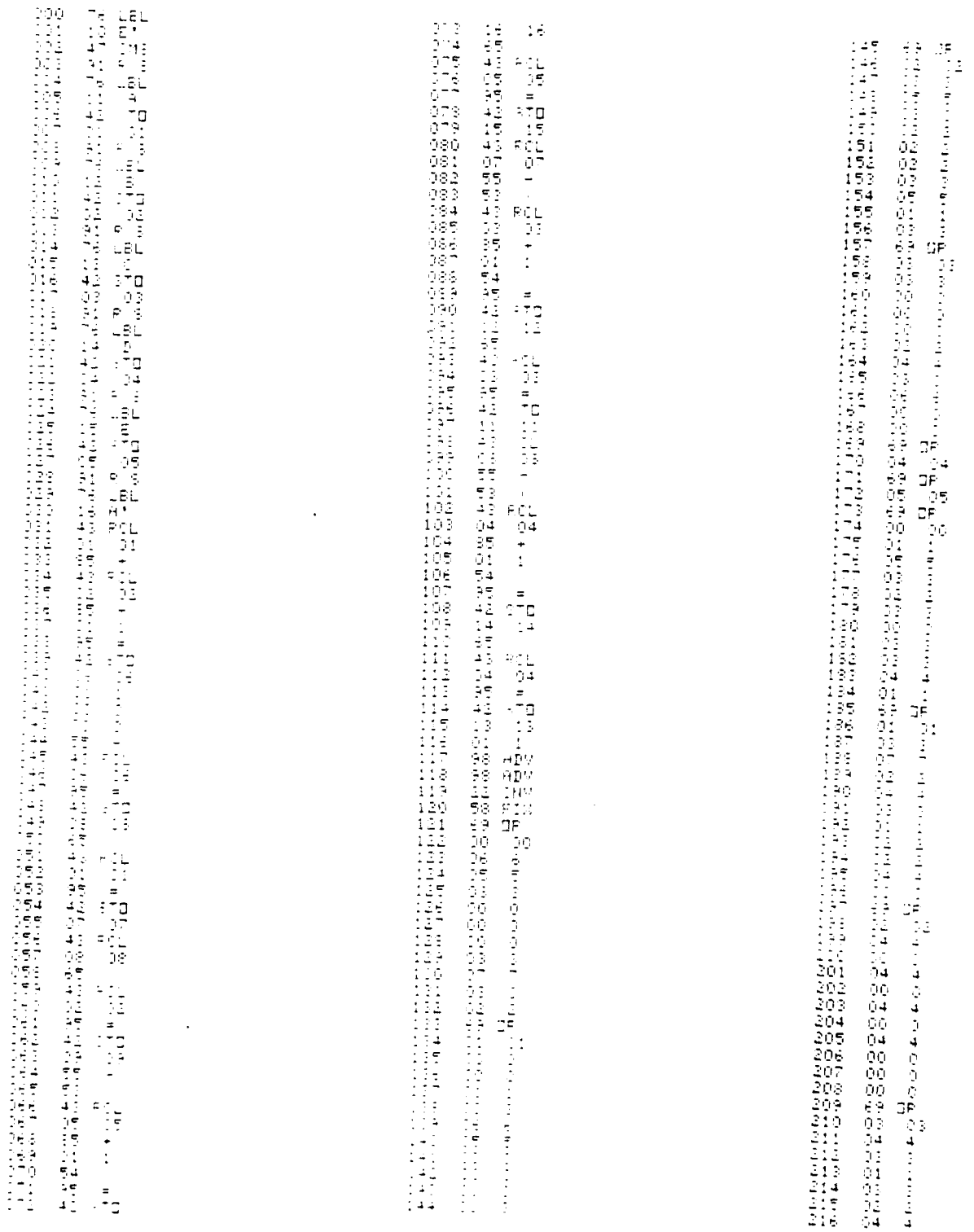


Figure C2. TI-59 steps required for the m_i to a_j program.

Figure C2. (Cont'd).

APPENDIX D:
NORMALIZE b PROGRAM

Using the Program

This appendix describes how to use the normalize b program after the program steps have been entered into the calculator. Figure D1 shows how to use the program to process the median b values in the STEP 2 TABLE of Figure 22. The resulting printout is keyed to each step of the process.

Program Steps Required

Before using the normalize b program, the program steps in Figure D2 must be entered into the calculator memory.

Algorithm Used

The median b values in the STEP 2 TABLE of Form B2 (see Figure 22) are in percentage form and do not always sum to 100 percent. The algorithm for this program is to sum the median b values in the STEP 2 TABLE of Form B2, to divide each median b value by this sum, and then to divide the results by 100 to convert to decimal form. The sum of the resulting six b′ values is 1. The following equation applies:

$$b/(100 \sum_{i=1}^{6} b_i) = b' \qquad \text{[Eq D1]}$$

Problem Statement: Compute the normalized values b′ for the median b_i values in the STEP 2 TABLE of Figure 22.

STEP	PROCEDURE	ENTER	PRESS	TI-59 DISPLAY	PC-100 PRINTER
1	Initialize the program		RST E		
2	Input median b_1	70	A	70.	
3	Input median b_2	30	B	30.	
4	Input median b_3	0	C	0.	
5	Input median b_4	0	D	0.	
6	Input median b_5	0	A′	0.	
7	Input median b_6	0	B′	0.	
8	Compute and output b′		D′		'NORMALIZE B' PGM IS COMPUTING. . . . . WAIT.
					INPUT WAS :
					70.00 B1
					30.00 B2
					0.00 B3
					0.00 B4
					0.00 B5
					0.00 B6
					NORMALIZED B VALUES=
					0.70 B1
					0.30 B2
					0.00 B3
					0.00 B4
					0.00 B5
				999	0.00 B6

Figure D1. Example problem for the normalize b program.

```
000   76  LBL
001   15   E
002   47  CMS
003   91  R/S
004   76  LBL
005   11   A
006   42  STO
007   01   01
008   91  R/S
009   76  LBL
010   12   B
011   42  STO
012   02   02
013   91  R/S
014   76  LBL
015   13   C
016   42  STO
017   03   03
018   91  R/S
019   76  LBL
020   14   D
021   42  STO
022   04   04
023   91  R/S
024   76  LBL
025   16   A'
026   42  STO
027   05   05
028   91  R/S
029   76  LBL
030   17   B'
031   42  STO
032   06   06
033   91  R/S
034   00   0
035   00   0
036   76  LBL
037   12   B'
038   43  RCL
039   01   01
040   55   ÷
041   43  RCL
042   02   02
043   95   =
044   42  STO
045   07   07
046   43  RCL
047   01   01
048   65   ×
049   43  RCL
050   03   03
051   95   =
052   85   +
053   43  RCL
054   06   06
055   95   =
056   42  STO
057   07   07
058   43  RCL
059   01   01
060   55   ÷
061   43  RCL
062   03   03
063   95   =
064   42  STO
065   08   08
066   43  RCL
067   02   02
068   55   ÷
069   43  RCL
070   07   07
071   95   =
072   42  STO
073   12   12
074   43  RCL
075   01   01
076   55   ÷
077   43  RCL
078   07   07
079   95   =
080   42  STO
081   13   13
082   43  RCL
083   04   04
084   55   ÷
085   43  RCL
086   07   07
087   95   =
088   42  STO
089   14   14
090   43  RCL
091   05   05
092   55   ÷
093   43  RCL
094   07   07
095   95   =
096   42  STO
097   15   15
098   43  RCL
099   06   06
100   55   ÷
101   43  RCL
102   07   07
103   95   =
104   42  STO
105   16   16
106   98  ADV
107   69  OP
108   00   00
109   06   6
110   05   5
111   03   3
112   01   1
113   03   3
114   02   2
115   03   3
116   05   5
117   03   3
118   00   0
119   69  OP
120   01   01
121   01   1
122   03   3
123   02   2
124   07   7
125   02   2
126   04   4
127   04   4
128   06   6
129   01   1
130   07   7
131   69  OP
132   02   02
133   00   0
134   00   0
135   01   1
136   04   4
137   06   6
138   05   5
139   00   0
140   00   0
141   03   3
142   03   3
143   69  OP
144   03   03
145   04   4
146   04   4
147   03   3
148   07   7
149   04   4
150   04   4
151   03   3
152   04   4
153   03   3
154   06   6
155   69  OP
156   04   04
157   69  OP
158   05   05
159   98  ADV
160   69  OP
161   01   01
162   00   0
163   00   0
164   00   0
165   00   0
166   00   0
167   00   0
168   00   0
169   00   0
170   00   0
171   00   0
172   00   0
173   00   0
174   00   0
175   00   0
176   00   0
177   00   0
178   00   0
179   00   0
180   00   0
181   00   0
182   00   0
183   00   0
184   00   0
185   00   0
186   00   0
187   00   0
188   00   0
189   00   0
190   00   0
191   00   0
192   00   0
193   00   0
194   00   0
195   00   0
196   00   0
197   00   0
198   00   0
199   00   0
200   00   0
201   00   0
202   00   0
203   00   0
204   00   0
205   00   0
206   00   0
207   00   0
208   00   0
209   00   0
210   00   0
211   00   0
212   00   0
213   00   0
214   00   0
215   00   0
216   00   0
```

Figure D2. *TI-59* steps required for the normalize b program.

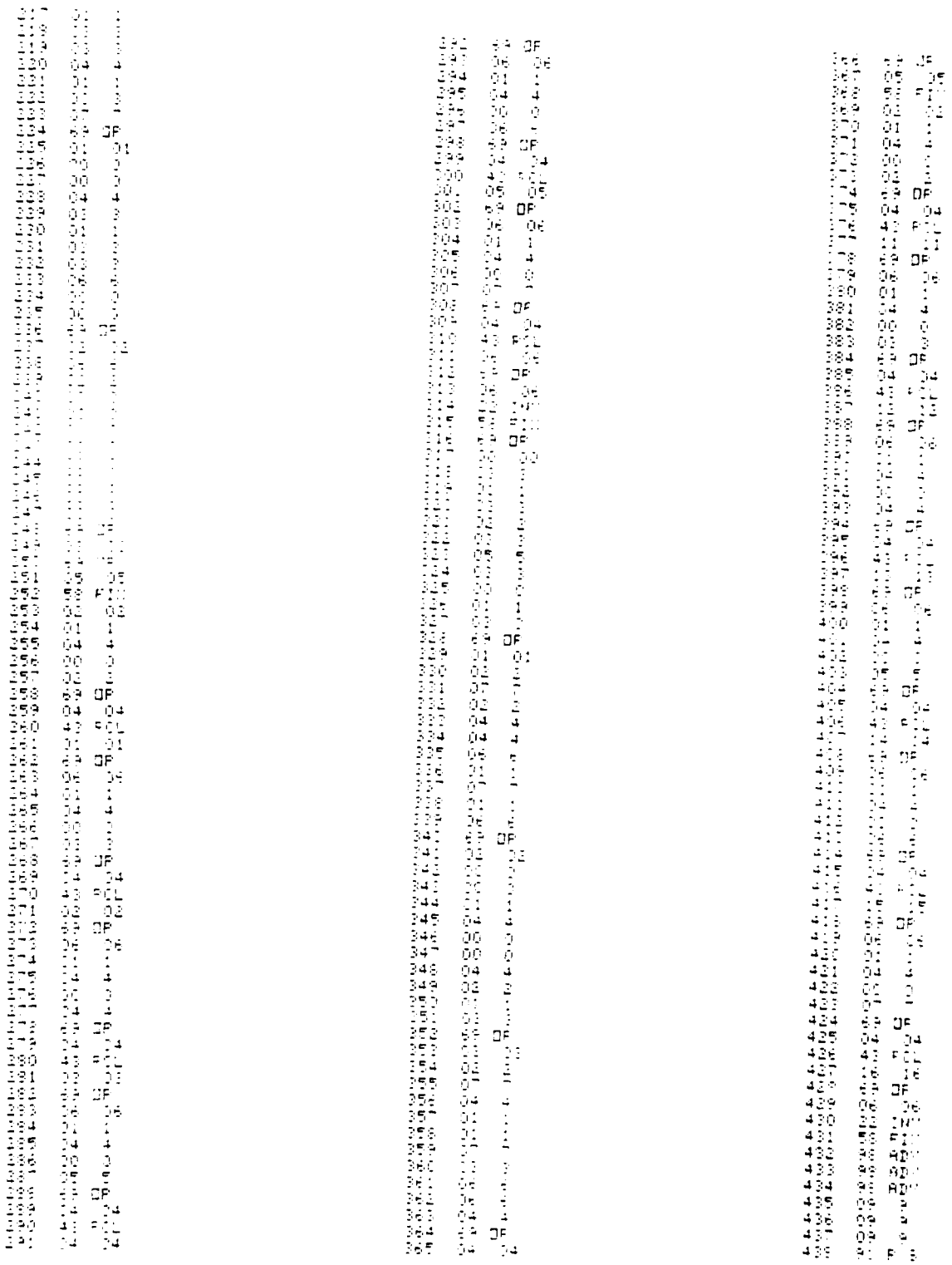


Figure D2. (Cont'd).

APPENDIX E:
BLANK FORMS

Rater's Initials: _____

Date: _____
(Day/mo/yr)

Rater's Office: (check one)

☐ ACE (1) ☐ DCSLOG (6)

☐ COA (2) ☐ DCSOPS (7)

☐ TAG (3) ☐ DCSPER (8)

☐ TSG (4) ☐ DCSRDA (9)

☐ ACSI (5) ☐ ACSAC (0)

PRIOR RATIOS ASSIGNED

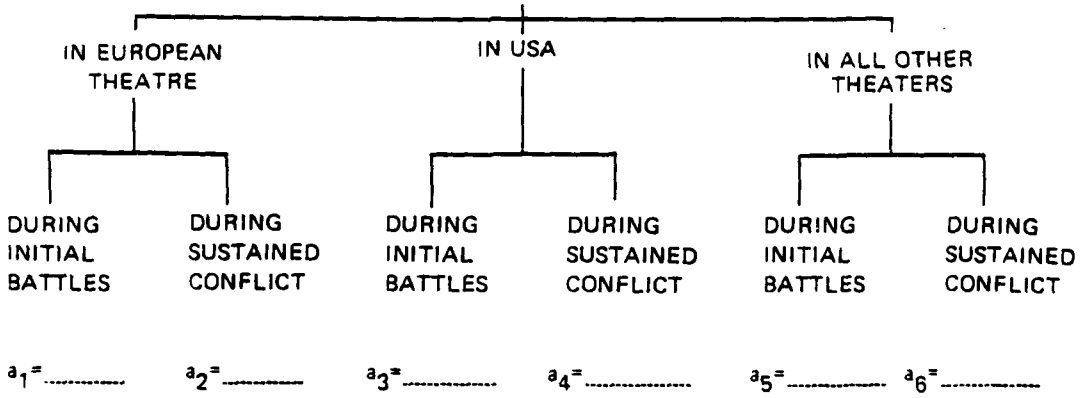
(as of:)

Low Q	Median	High Q
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

RELATIVE IMPORTANCE OF READINESS SUB-OBJECTIVES

Mission Sub-Objectives Being Compared	Relative Significance (Ratio)
European Theater / USA	_____
All Other Theaters / USA	_____
Europe: Initial / Sustained	_____
USA: Initial / Sustained	_____
Other: Initial / Sustained	_____

ARMY READINESS TO ACCOMPLISH MISSIONS



(BOX RESERVED FOR FEEDBACK INFORMATION)

Form A (Proposed)

PROCESSING INSTRUCTIONS FOR FORM "A" INPUT DATA

Initials:_____ Date Processed:_____

STEP 1: Enter into the respective box below the decimal equivalent (to the nearest 0.01) of each ratio from basic input Form A.

STEP 1 TABLE

	ACE (1)	COA (2)	TAG (3)	TSG (4)	ACSI (5)	DCSLOG (6)	DCSOPS (7)	DCSPER (8)	DCSRDA (9)	ACSAC (0)
EUR/USA										
OTH/USA										
EUR: I/S										
USA: I/S										
OTH: I/S										

STEP 2: Using the program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for each row of numbers above and record results in the Step 2 table below and on Form A (as feedback information.)

STEP 3: Using the program, "m_i to a_j," compute a_1 through a_6 (to the nearest 0.01) and record the six values on Form A (as feedback information), in Step 3 table below, and on Form C.

STEP 2 TABLE

ROW	OBJECTIVE	LOW Q	MEDIAN	HIGH Q
1	EUR/USA	l_1:	m_1:	h_1:
2	OTH/USA	l_2:	m_2:	h_2:
3	EUR:I/S	l_3:	m_3:	h_3:
4	USA:I/S	l_4:	m_4:	h_4:
5	OTH:I/S	l_5:	m_5:	h_5:

STEP 3 TABLE

MISSION WEIGHTS
a_1:
a_2:
a_3:
a_4:
a_5:
a_6:

Form A1 (Proposed)

Rater's Office. (check one)

Rater's Initials: _____

Date: _____
Day/mo/yr

☐ ACE (1) ☐ DCSLOG (6)
☐ COA (2) ☐ DCSOPS (7)
☐ TAG (3) ☐ DCSPER (8)
☐ TSG (4) ☐ DCSRDA (9)
☐ ACSI (5) ☐ ACSAC (0)

PROJECT IDENTIFICATION AND PROJECT RATINGS

LOCATION PN DESCRIPTION

PRIOR RATING RESULTS

(as of)

r VALUES

Low Q	Median	High Q
.....	.....	.....

b VALUES

Low Q	Median	High Q
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

w VALUES

Low Q	Median	High Q
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Note: Feedback values for each r,b, and w are independent of all other r,b,and w values. Median values of b will be normalized before use in later computations. Median values of r and w will be used directly.

Project Relevance to Readiness (%)

r= _____

Mission Sub-Objective	Relative Contribution of Project to each Sub-Objective (%)
Europe-Initial	b_1= _____
Europe-Sustained	b_2= _____
USA-Initial	b_3= _____
USA-Sustained	b_4= _____
Other-Initial	b_5= _____
Other-Sustained	b_6= _____

(Total =100%)

Mission Sub- Objective	Project Worth*
Europe-Initial	w_1= _____
Europe-Sustained	w_2= _____
USA-Initial	w_3= _____
USA-Sustained	w_4= _____
Other-Initial	w_5= _____
Other-Sustained	w_6= _____

*(On a scale of 1 to 100, compare project to some "Maximum Contribution" Project.)

$B_c/\$PA$= _____

(BOX RESERVED FOR FEEDBACK INFORMATION)

Form 8 (Proposed)

PROCESSING INSTRUCTIONS FOR FORM "B" INPUT DATA

PN: _____ Initials: _____ Date Processed: _____

	ACE	COA	TAG	TSG	ACSI	DCSLOG	DCSOPS	DCSPER	DCSRDA	ACSAC
r:										
b_1:										
b_2:										
b_3:										
b_4:										
b_5:										
b_6:										
w_1:										
w_2:										
w_3:										
w_4:										
w_5:										
w_6:										

Transfer the individual ratings from Forms B to the respective boxes above. Cross out (x) any columns for which no ratings were made. Continue processing on Form B2.

Form B1 (Proposed)

PROCESSING INSTRUCTIONS FOR FORM "B-1" DATA

PN: _____ Initials: _____ Date Processed: _____

STEP 1: Using program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for the "r" values on Form B-1. Enter results here and on Form "B" (as feedback information.)

r: Low Q. _____(%) Median _____(%) High Q. _____(%)

Enter the decimal form of the Median Value of "r" on Form C in six places.

STEP 2: Using the program "Statistical Analysis," compute the Low Quartile, Median, and High Quartile values for rows b_1 through b_6 on Form B-1 and enter results in the Step 2 table below and on Form B (as feedback information.)

STEP 3: Using the program "Normalize b_i," compute the decimal form of the normalized values of b_i and enter them in the Step 3 table below and on the B/C Computation sheet, Form C.

STEP 2 TABLE

	Low Q (%)	Median (%)	High Q (%)
b_1:			
b_2:			
b_3:			
b_4:			
b_5:			
b_6:			

STEP 3 TABLE

Normalized Median	
b'_1	
b'_2	
b'_3	
b'_4	
b'_5	
b'_6	

STEP 4: Using program "Statistical Analysis" compute the Low Quartile, Median, and High Quartile values for rows w_1 through w_6 of Form B-1. Enter results in the Step 4 table below and on Form "B" (as feedback information.) Enter the decimal form of the Median w_i values on the B/C Computation sheet, Form C.

STEP 4 TABLE

	Low Q (%)	Median (%)	High Q (%)
w_1:			
w_2:			
w_3:			
w_4:			
w_5:			
w_6:			

Form B2 (Proposed)

PROJECT B/C COMPUTATION SHEET

Compute the Benefit Cost Ratios $(b/c)_1$ through $(b/c)_6$ by multiplying the values in the boxes. Blank boxes equal zero. Sum the six $(b/c)_i$ ratios to get $B_R/\$PA$.

RELATIVE IMPORTANCE (a_i) OF MISSION SUB-OBJECTIVE		RELATIVE CONTRIBUTION (b_i) TO MISSION SUB-OBJECTIVE (Normalized)		RELATIVE PROJECT WORTH (w_i) WITHIN SUB-OBJECTIVE		PROJECT RELEVANCE (r) TO FORCE READINESS		
☐ (a_1)	X	☐ (b'_1)	X	☐ (w_1)	X	☐ (r)	=	____ $(b/c)_1$
☐ (a_2)	X	☐ (b'_2)	X	☐ (w_2)	X	☐ (r)	=	____ $(b/c)_2$
☐ (a_3)	X	☐ (b'_3)	X	☐ (w_3)	X	☐ (r)	=	____ $(b/c)_3$
☐ (a_4)	X	☐ (b'_4)	X	☐ (w_4)	X	☐ (r)	=	____ $(b/c)_4$
☐ (a_5)	X	☐ (b'_5)	X	☐ (w_5)	X	☐ (r)	=	____ $(b/c)_5$
☐ (a_6)	X	☐ (b'_6)	X	☐ (w_6)	X	☐ (r)	=	____ $(b/c)_6$

(SUM TO GET $B_R/\$PA$)

Initials: _____

Date Processed: _____

PN: _____

SUM= _____ = $B_R/\$PA$
(Enter on Form B)

Form C (Proposed)

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53 p. (Technical report ; P-124)

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